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Using Diamond Tools in Motor Building

Definite Information Concerning the Accuracy, Interchangeability and Long Life Obtained with Diamond Tools in Aluminum, Bronze and Cast Iron

By G. T. LINTING
Tool Engineer

DURING the late war the writer was chief tool designer for a large motor building plant that experienced great difficulty in boring or reaming the main bearings in the aluminum crankcases of Liberty motors. This motor had a seven-bearing crankshaft and differed from the usual type in having the crankcase cast in upper and lower halves, with one half of each bearing in both parts. The bearings were 3.0000 in. in diameter and from 3 to 5 in. long.

After boring, two halves of the crankcase were bolted together with a reamer bar 3.0000 in. in diameter in place, the bar carrying seven sets of inserted helical blades.

It was found impossible to maintain the bearings to size or in alignment, the variation amounting to as much as 0.002 in. or more in some cases. This variation made it necessary to employ about eighty-five men to scrape the main bearings.

The writer finally hit upon the plan of using an engine lathe, upon the carriage of which was mounted a simple angle-plate fixture, carrying boring bars and driven by a multiple driving head connected to the spindle. The boring bars carried seven diamond-set tools. By diamond-set, I mean that we actually cast small carbon diamonds weighing from 1 to 2 carats in the ends of steel shanks or holders, and inserted the holders in the bars.

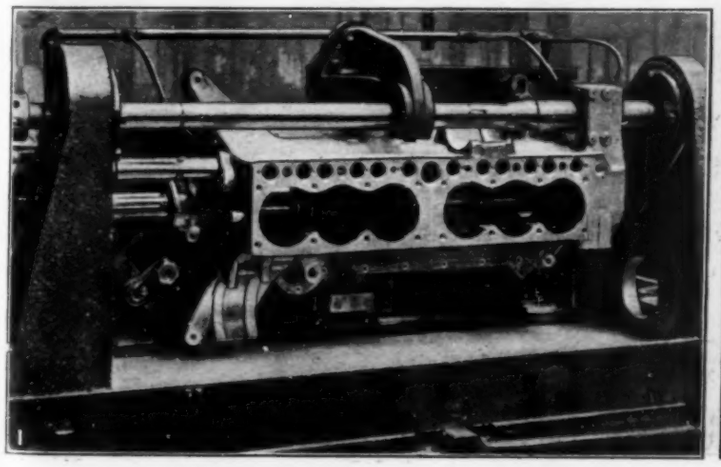
We first roughed out the bore of the crankcase with ordinary high-speed steel tools, leaving from 0.004 to 0.008 in. of the diameter to be taken out by the diamonds. The result was a surprise to everyone. We finish bored the remainder of our Liberty motor crankcases (about 800 upper and 800 lower halves) with the one bar, and without having to sharpen or reset the tools.

Each and every half-hole was of the same size, and all were in alignment. This meant that the bronze backed bearings could be placed in the cases, the halves bolted together with the crankshaft in place and that the job was within the required tolerance. Incidentally, we eliminated all scraping, thus saving the cost of the diamond tools in two days.

The experience gained in boring the Liberty motor crankcases with diamond tools was naturally utilized in other directions after the war. With this in mind the writer designed the boring fixture shown in Figs. 1 and 2 for finish-boring the main bearings in the aluminum crankcase of the Marmon model 34-B, which is the current model.

The holes were first rough and semi-finish bored with common high-speed tools in a lathe fixture like the one shown in Fig. 2. They were then finish-bored with diamond tools in a third fixture. The Marmon crankcase is a three-bearing job, the bearings being about 3½ in. in diameter. The rear bearing is about 4 in. long and the middle and front bearings somewhat shorter.

We used the identical tools, used for boring the Liberty motor cases, without sharpening or resetting. One of these tools bored some 3,000 half-holes. Another bored 5,500 half-holes before needing sharpening, while the third tool at last accounts had bored 7,800 half-holes. It was still going strong, and was apparently as good as the first day it was used. All this was in addition to the 1,800 half-holes bored on the Liberty job. In Fig. 2 is shown part of the boring bar with two of the



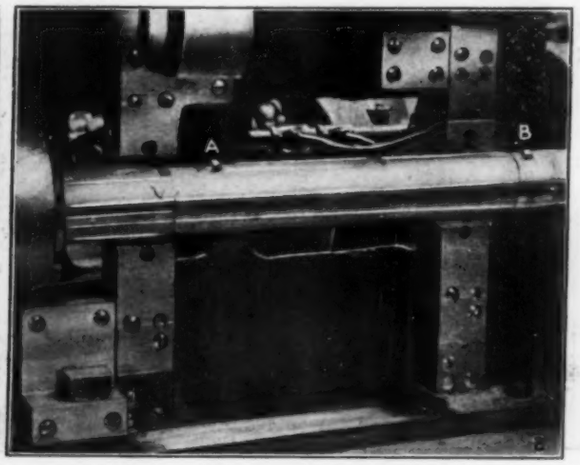


FIG. 1—FINISH BORING MARMON CRANKCASE. FIG. 2—THE BORING BAR AND DIAMOND TOOLS USED

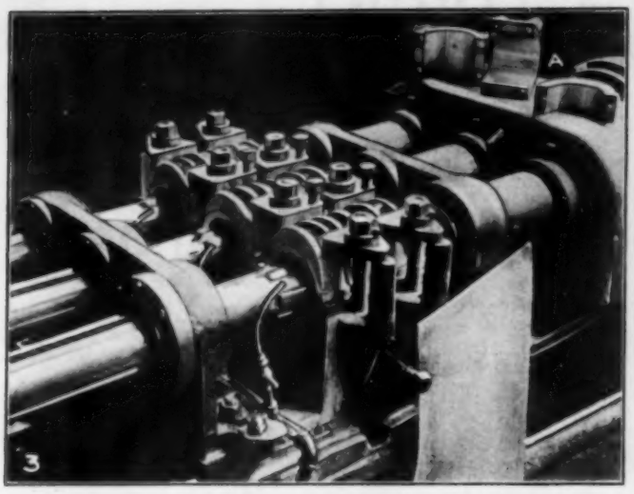


FIG. 3—BORING THE BEARING CAPS IN GROUPS.

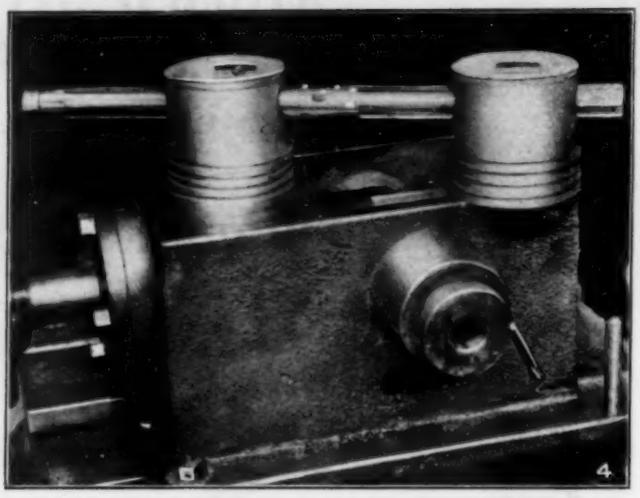


FIG. 4—FIXTURE AND BAR FOR BORING PISTONS

diamond tools in place at *A* and *B*, while Fig. 1 shows the crankcase in place in the boring fixture.

The great reason for using diamond tools is to be able to bore holes, that do not vary more than 0.0001 in. from the desired size, and to have them straight and in line. This accuracy enables the assembling of the case, bearing shells and caps, without any scraping or fitting whatever. It also makes a far better job than is possible to obtain by any other known method; in fact the Marmon company states that it has never had occasion to replace a single main-bearing shell. The accuracy attained also means absolute interchangeability, as the tools once set need no attention whatever for from 5,000 to 15,000 or more holes. What would this mean in the production in many plants?

The boring of the aluminum main-bearing caps for the Marmon motor is shown in Fig. 3. It will be noted that the caps are bored separately from the case. The caps are rough- and finish-bored, the first two bars leaving 0.004 to 0.008 in. stock, and finished with the third bar, which is equipped with diamond tools. Three of the finished caps are shown on the multiple boring head at *A*. The caps are sent directly to stock from this operation, after inspection.

In Fig. 4 is shown how the Marmon aluminum piston is cross-bored for the piston pin on a small engine lathe equipped with diamond tool boring bar. Two of the piston heads are shown on top of the boring fixture together with the diamond boring bar.

In Fig. 5 is shown how the bronze bushing in the wristpin end of the connecting rod is bored, using the diamond tool at *A*. One of the finished rods is shown on top of the fixture and one in boring position.

Anyone who has had experience knows how hard it is to obtain a round, true hole in bronze. The diamond tool gives the round hole desired and thus eliminates the heavy expense of reamer upkeep.

In Fig. 6 is shown how the Marmon company finishes the joint faces of bearing shells on an ordinary crank shaper. The shells are of cast iron, lined with babbitt. The shaper ram is fitted with a special double toolholder head with micrometer adjustment for each tool. The heads hold the diamond tools, the shanks of which may be seen sticking out of the holders at *A* and *B*.

The faces of the shells are machined to the center, plus or minus 0.0001 in., in this operation. They are machined singly instead of in pairs and are sent to stock after being inspected with an amplifying gage.

A cast-iron crankcase of a Midwest Engine Co. motor is shown in Fig. 7, and Fig. 8 shows the fixture in

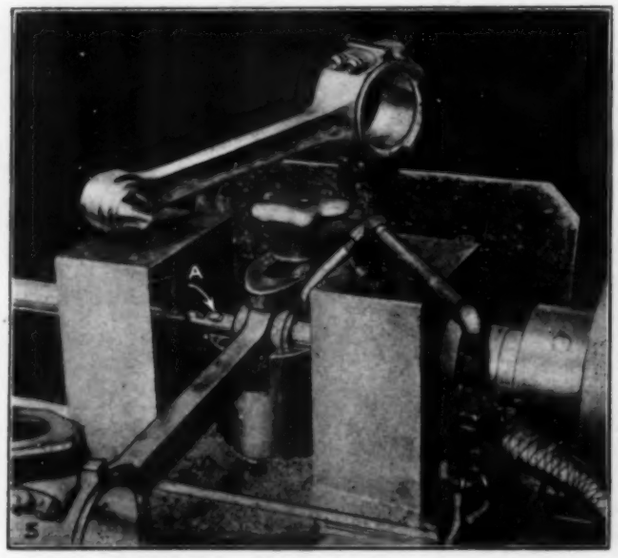


FIG. 5—BORING SMALL END OF CONNECTING ROD.

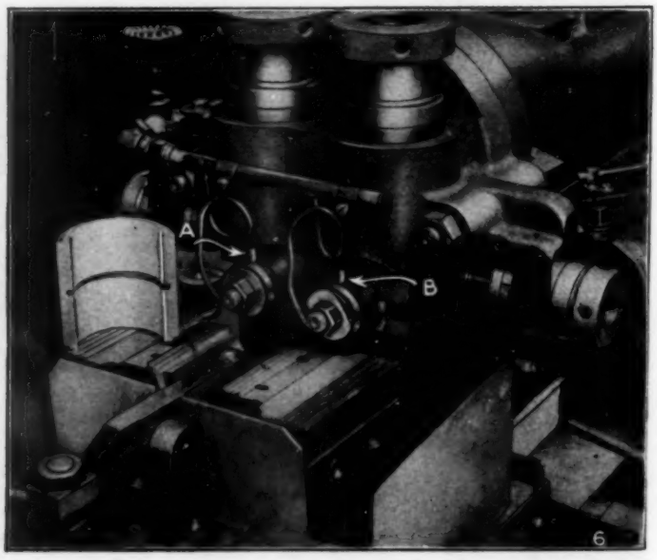


FIG. 6—SURFACING EDGES OF BEARINGS

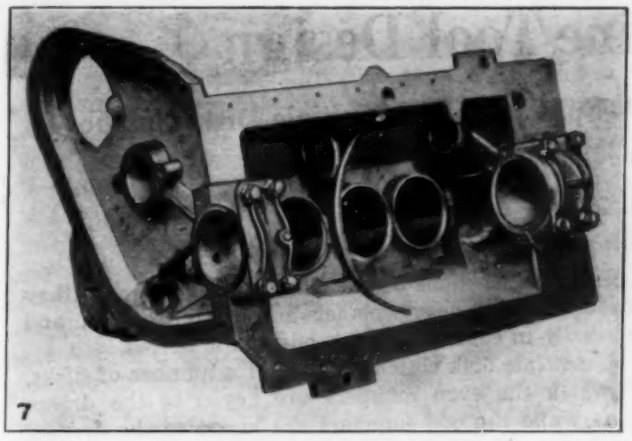


FIG. 7—A MIDWEST CYLINDER BLOCK. FIG. 8—THE FIXTURE FOR BORING THE MIDWEST CYLINDER BLOCK

which it was bored, mounted on the carriage of an engine lathe. The rough- and finish-boring is done with Stellite tools and the sizing with one pass of a diamond tool. In this case the caps are bolted to the crankcase and both are bored together. This job was started in December, 1921, and the original diamonds are still on the job. At the present writing they have never been sharpened, and are apparently good for an indefinite time.

The diamond tools work as well on this cast-iron case as they do on the Marmon aluminum crankcase or on the bronze bushing on the Marmon connecting rod previously mentioned.

Particular attention is called to the extreme simplicity and ruggedness of the fixture and boring bars. Yet they produce work of gage-like precision on a production basis, using only common engine lathes in almost any state of repair, because the boring bars and fixtures are self-contained and are piloted fore and aft the work.

Diamond tools such as here described, can be used very economically in a variety of ways where extreme accuracy is desired. They may also be used for contact points in gages that are subjected to much wear. Used in this way diamonds would last for years, as they would not wear measurably, would not scratch and could be reset if necessary.

The Foreman Pulls a "Boner"

BY ROBERT TAIT

This is the time of year when we hear frequent allusions to the "bonehead plays" made by members of the home team, to the infinite disgust of the fans, some of whom are apt to be toolmakers or machinists. But how about the mechanical "boners" which all of us perpetrate at times? No doubt there are but very few of us who have not at some time during our career made such an absolutely foolish error in our work as to cause us to stop and ponder whether or not we were in the normal possession of our faculties.

I was an apprentice in a machine shop at the time, working under a foreman who was one of the finest I have ever known, both as a man and a mechanic. In conversation with some of us one noon hour he casually mentioned that we had to have a small pulley placed at about the center of a 20 ft. length of 1 7/16-in. line shaft which had a coupling keyed to each end and carried a fine collection of iron pulleys of assorted sizes.

A chorus of groans greeted his words. It was always up to the machine shop gang to handle all such jobs and none of us knew who was going to be elected. Suddenly the foreman said, "I have an idea. We don't need that thing for a few days and I will show you fellows how to get a pulley on that shaft without taking it down." Naturally we believed him, for he generally made good, and, as he gave out no further information, we awaited developments with much interest. During his spare time he was seen to saw a piece of cast iron bushing stock in halves lengthwise, dowel it together, bore it to fit the shaft and turn it to the proper pulley diameter. He further reduced the diameter at each end (for a length equal to about one-quarter of the length of the casting), approximately one inch, finishing these ends with a taper of about 1/8 in. per foot. This part nicely finished, he proceeded to make two steel collars somewhat smaller than the pulley diameter and bored to fit the tapers previously referred to. These also completed, pulley and collars were laid on his desk.

Shortly before noon the next day he instructed a helper to get a ladder and place it against the shaft about where we knew the new pulley was to go. As the power was shut off practically all of the gang who carried their lunches got front seats within sight of the base of operations and awaited results. The boss remarked dryly, "If you like to work half as well as you seem to like to watch me, the shop could get along with a lot less help." By this time he had arrived at the shaft, carrying the precious pulley in one hand, while the two rings and a hammer to drive them home were in his pockets. The suspense among his audience was great by this time, but he never realized what he was doing until, having placed one-half of the bushing under the shaft, he carefully slipped the upper half in place, fished a collar out of his pocket and, as he had it poised in the air the fact that a solid collar would have to go on over the end of a shaft as well as a solid pulley, became apparent to him.

Before coming down from his perch he looked over his audience and, picking out four fellows who seemed to be getting the most enjoyment out of the situation, he gently but firmly conveyed to them the information that they were to come back after supper, take out that length of shafting, remove a coupling and mess of pulleys, place his special pulley at the point designated and get the shaft back in place. This they did quite cheerfully, an irksome task being materially eased by the comedy which they had been privileged to witness.

Methods of Machine Tool Design

Fourth and Last Part of Chapter on Clutches—Split Ring and Multiple Disk Clutches—Clutches Operated by Air, Water or Electricity

By A. L. De LEEUW
Consulting Editor, *American Machinist.*

SPLIT ring clutches are used more perhaps than any other kind in machine tool design. Their chief merits are their cheapness of construction and the small amount of space they occupy for a given amount of power to be transmitted. Their chief disadvantages are the fact that they are out of balance, and the difficulty of making proper adjustment. So long as the clutch runs at relatively low speed and is of relatively small diameter, the unbalanced condition is not a serious drawback; but when the clutch runs at a high speed and is of large diameter, this unbalanced condition alone would condemn it for use on machine tools.

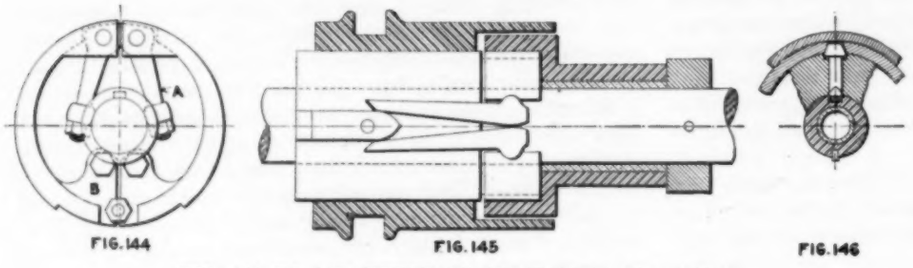


FIG. 144 TO 146—TYPES OF SPLIT RING CLUTCHES

A clutch such as shown in Fig. 144 is particularly hard to balance, especially for dynamic or running balance. It further has the disadvantage that at the points where the levers *A* are attached and where it is attached to the hub *B*, there is a large amount of metal which prevents the split ring from maintaining its true cylindrical shape when expanded, so that only part of the ring is actually useful for the transmission of power. This condition does not prevail with the clutch shown in Fig. 145. The construction of this latter clutch permits of small dimensions, so that the unbalanced condition does not cause serious trouble.

A clutch such as shown in Fig. 146 is not much out of balance, and the entire ring provides bearing surface for the transmission of power. On the other hand, the wedge is liable to stick in the clutch because there is no positive means of withdrawing it, though, of course, this might be provided for. Another disadvantage of this type of clutch is that it permits of but very little adjustment before it becomes necessary to take it apart in order to provide for further adjustment. As a whole, friction clutches of the split ring type are not so satisfactory as those of the single plate type, except for light loads and low speeds.

Multiple disk clutches are not used very much for machine tool design. However, they may be used to advantage where large amounts of power have to be transmitted and where the machine is stopped and started or reversed a great number of times. The reason why they are particularly useful for this latter kind of service is that it is possible to keep the pressure per unit of friction surface very low without getting excessive dimensions of the clutch. Consequently, they are useful for heavy planer and slotter drives, and especially in connection with pneumatic drives.

A multiple disk clutch consists of a number of disks, of which the even numbers are keyed to the driven shaft while the odd numbers are keyed to the driving member, or vice versa. The essential points to look out for are: First, a sufficient amount of surface on the keys; second, a sufficient amount of surface on the plates; third, a means to keep the plates from overheating under conditions of frequent starting and stopping. This latter requirement may be met by the circulation of oil between the plates. Such circulation naturally diminishes the coefficient of friction between the plates, making it necessary to provide a large amount of frictional surface. The point in itself is rather an advantage, provided that there is enough room for large diameter or great length of clutch.

As, even with the best of care, there is always danger that the plates will wear so that metallic particles may get into the bearings, besides causing the plates to weaken gradually, it is well to select frictional surfaces which are not subject to much wear. For this purpose one set of plates—let us say the odd ones—is provided with cored holes in which blocks of wood are fitted. Hickory and beech are particularly useful for this purpose, especially if they have been boiled in paraffin for a number of hours before being put in place.

Such wood blocks again cause the clutch to become longer, but this is no disadvantage, provided the necessary room is to be had, especially since this extra room in an axial direction provides for more room on the keys and permits of making somewhat more clearance space between the plates, thus preventing the plates from touching each other except at the friction surfaces. In Fig. 147 the view *A* shows a diagrammatic view of such

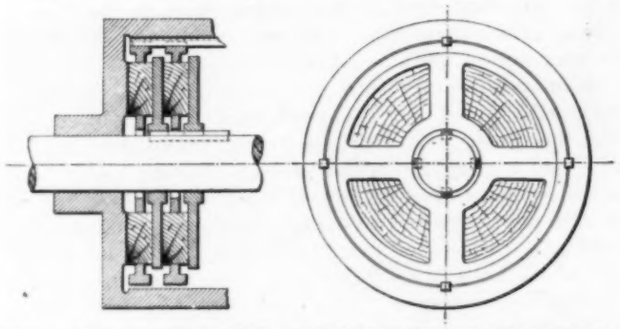


FIG. 147—MULTIPLE DISK CLUTCH FACED WITH WOOD

an arrangement of wood blocks, while *B* shows the form a plate takes when it is provided with these blocks.

There may be occasion to use a multiple disk clutch of smaller size, but when this is done it must not be forgotten that the conditions are the opposite from what is met in automobile construction. In the automobile the clutch is always in, except when pushed out. In the machine tool the clutch should always be out, except when pushed in; or, put in other words, the automobile clutch is self-acting, whereas the machine tool clutch is hand-operated.

Pneumatic, hydraulic and magnetic clutches are misnamed. They are, in reality, friction clutches operated by air, by hydraulic pressure, or by magnetism.

At one time magnetic clutches seemed to promise a great deal for heavy machine tool construction, and were actually used for a number of large planers and slotters. It was soon found, however, that they were unsatisfactory and unreliable. As constructed, the clutch consisted of two members, one rotating freely, the other one keyed to the shaft to be driven. The rotating member contained the coil and was magnetized by this coil. It was made of mild steel and the coil, mounted on a brass or bronze bobbin, was laid in an annular groove. This arrangement is shown in diagrammatic form in Fig. 148. Collector rings were placed on the hub of the bobbin. The part which was keyed to the driven shaft was made as light as possible, so as to reduce its inertia; though, of course, a sufficient amount of metal was required in the flange for the magnetic circuit. When the current was turned on part *A* was magnetized and attracted the armature *B*. The friction between the two members would then drive the shaft. When the current was turned off, member *A* was supposed to lose its magnetism and member *B* was pushed away by means of a spring or some other contrivance.

As a matter of fact, these clutches were only used to any extent for planer drives, so that there would be two members *A* and a double member *B*, as shown in Fig. 149. The two members *A* would run in opposite

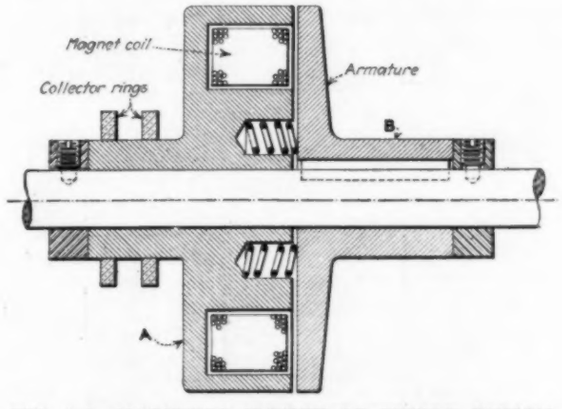


FIG. 148—MAGNETIC CLUTCH OF SIMPLE DESIGN

directions and the member *B* would slide along the shaft from A_1 to A_2, and *vice versa*, according to which of the two was receiving current. The amount of movement *B* had along the shaft had to be kept very small in order to keep the air gap between the magnet and armature to a minimum.

Notwithstanding the small amount of space between the armature and the non-acting magnet, there would be considerable resistance against the magnetic flux when the current was reversed; so that *B* would be attracted to A_2 with very much less force at the beginning of its sliding motion than when it was face to face with the magnet. When this attraction, then, was at a minimum, *B* was still attached to A_1; and though the current was turned off from this latter magnet, yet the residual magnetism was great enough to retard the movement of *B* toward A_2. It was not until the magnetism in A_2 had been built up to practically its full

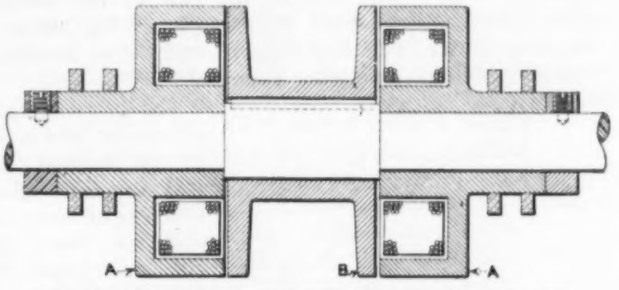


FIG. 149—MAGNETIC CLUTCH FOR PLANER DRIVE

strength that *B* would be released from A_1, and even this did not always take place. Furthermore, when the planer had to be brought to a stop current was turned off from both magnets, but one of them would retain its magnetism sufficiently to cause the planer to continue its stroke, which often caused the table to run off.

Many and various schemes were developed to overcome this unsatisfactory action of the magnetic clutch. Among them was the covering of the magnet face with a thin plate of brass. However, this plate would soon wear out and had, at all times, the disadvantage of reducing materially the magnetic attraction. Another means was to insert corks either in the armature or in the magnet. This also had the disadvantage of reducing the attraction, the amount of cork surface was always too small to sustain the very heavy pressure, and the projecting part of the corks was very soon worn off. These and other difficulties, such for instance as that some dirt or oil on the collector rings might cause other disturbances, have caused the magnetic clutch to be abandoned for planer drives.

A Form of Magnetic Clutch Which Can Be Used

There is another form of magnetic clutch which is really different from the friction clutch because the members which act on each other are not in contact. Such a clutch consists of a rotating magnet, while the driven member is a copper disk separated from the rotating member by a very small distance in the direction of the axis. The rotation of the magnet sets up eddy currents and causes a drag on the copper plate. If another magnet is located on the other side of the copper plate and arranged to turn in the opposite direction when it receives current, it will take the plate along and thus reverse its motion.

The objections to this device lie in the fact that the drag is caused by a difference in the speeds of the magnet and the plate. When the plate has reached its full speed, this difference is a minimum, but when the plate must be started up the difference is a maximum. As part of the energy required to start up the plate is converted into heat, such a device will become very hot when there is frequent reversal or frequent starting and stopping. The difficulties connected with keeping

such a device cool are quite severe. Even at that, this device is more successful than the magnetic clutch first described and might be used in a number of cases.

The amount of energy stored up in the large magnet is quite considerable, so that it takes an appreciable amount of time before it is built up to its full strength. Though this lag is noticeable, it causes no other trouble than that mentioned before, namely that it delays the reversal of the planer a small amount of time. This means simply that the dogs have to be set forward. As a rule, the dog which acts at the end of the cutting stroke does not run past the tappet. When using a magnetic clutch, dog and tappet must be so arranged that such run-over becomes permissible.

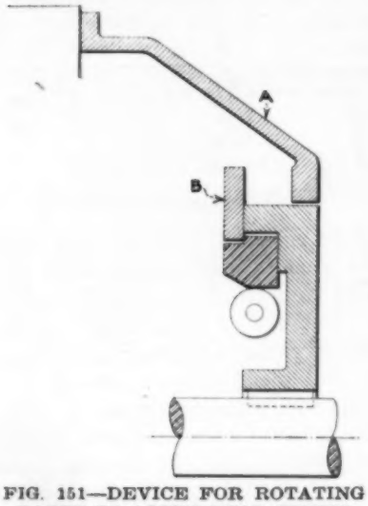


FIG. 151—DEVICE FOR ROTATING PARTS TO ALIGN GEAR TEETH

The large amount of energy stored up in the magnet has still another effect which is of more importance than the one mentioned before. At the moment the current is switched over from one magnet to another, practically all of the stored-up energy is discharged instantaneously, causing a heavy arc at the switch. This arcing causes a great deal of trouble with the controlling equipment, even a magnetic blowout failing to overcome it entirely. Not only is there a tendency to destroy the switches and other controlling apparatus, but there is a chance of the insulation of the magnet being punctured by the discharge, so that extreme care must be taken in winding and insulating the coil.

The pneumatic clutch is merely a friction clutch operated by a pneumatic cylinder instead of by a system of levers or toggles. It is chiefly used for planer drives and, of course, must be made double-acting for this purpose. Fig. 150 shows a double-acting pneumatic clutch in diagrammatic form. No details are shown of the clutch part itself. The clutch as represented here is of the multiple plate type. The spaces indicated by *A* and *B* are occupied by the two clutches. The member *C* can slide on the shaft, to which the member *D* is immovably fastened. This member *D* is the piston of the pneumatic cylinder, which is formed by *C*.

A hole *E* in the shaft admits air to one side of the piston. This hole is made large enough so that a pipe *F* can be inserted inside of this hole and still leave room for air to go to chamber *P*. A valve is so arranged that it admits air to *P* and exhausts from *Q* in one position, while in another position it admits air to *Q* and exhausts from *P*. Proper stuffing boxes must be provided at the end of the shaft, and these boxes must be so arranged that they permit the shaft to turn without causing leakage. There are, of course, many other ways in which such a clutch might be arranged, nor is it necessary that the clutch should be of the multiple disk type. As pneumatic devices of various kinds will be taken up at least in principle in a future chapter, we shall go no further into this matter at present.

Hydraulic pressure might be used instead of pneumatic pressure but, though many hydraulic devices are used in machine tools, to the writer's knowledge they have not been used for the purpose of operating clutches. They might be very usefully employed where an extremely slow action in starting is required, because it is possible to control the inrush of water by means of a needle valve to any desired speed. Such needle valves might also be used, and for that matter are used, for pneumatic control; but it is much more difficult to set and maintain the opening to the desired limits when using air than when using water, because the opening is so much smaller to begin with. Furthermore, the abrasive effect of particles of dust carried along with the air current is much greater than corresponding wear in a hydraulic needle valve.

In many cases a brake is required to assist in stopping a machine as quickly as possible, and such brakes are ordinarily arranged to be operated by the same lever which operates the starting clutch. Such brakes are generally of the simplest possible construction, often being merely a conical end of the sliding part of the clutch starting device. This sliding part is naturally keyed on to the shaft which should be stopped. The conical end of this sliding part can be brought against a mating part of the frame or any other stationary member. In other cases a band brake is employed. In still other cases the brake is separate from the starting device and is operated by foot. There is, however, nothing in such a brake which calls for special methods of design. Almost any construction of brake can be employed and, as a rule considerations of location or available space or handiness of operation control the choice of such a braking device.

A brake which is being more and more employed is

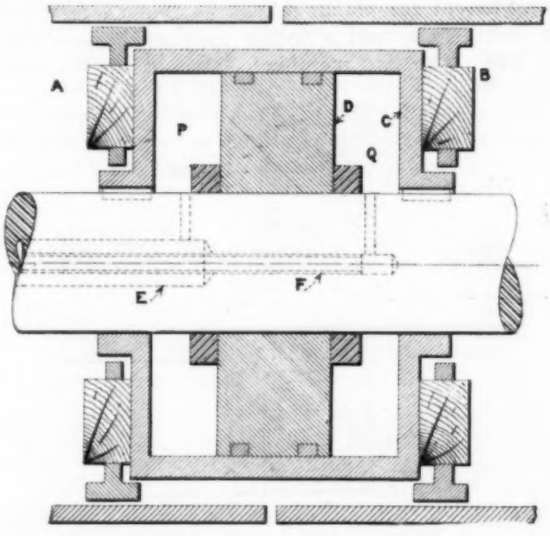


FIG. 150—DOUBLE-ACTING PNEUMATIC CLUTCH

the so-called dynamic brake. This is merely an arrangement of the wiring of the motor controlling device, by which the motor becomes a generator the moment it is cut out from the line. The energy it generates is dissipated in some resistance, provided in the controller. By making this resistance *low*, the generator acts almost as if it were short circuited and stops almost instantly,

because it has to overcome an enormous load. By regulating the amount of resistance, the machine can be made to stop as quickly or as slowly as desired.

Where gear shifts are used it is often necessary to have some means of revolving the gears to be shifted in order to make it possible to have the teeth of one gear enter the spaces of another. Sometimes this is accomplished by throwing the friction clutch in and then out again and watching the opportunity when the gears have slowed down sufficiently to make the shift possible. This is rather an uncertain method, especially so if no visible member of the machine is running when the starting clutch has been thrown in. Even when there is such a visible member, its speed is not always an indication of the speed of the gear which should be shifted. For instance, it may be possible to observe the spindle of the machine, but this spindle may be running at a low speed, though the gear to be shifted, one of the first gears in the system, may be running at a fairly high speed.

To overcome this difficulty devices such as the one shown in Fig. 151 are sometimes employed. In this device *A* is a cap fastened to the pulley, and *B* is a ring fastened to the sliding member which holds the floating ring that operates on the levers of the friction clutch. When this member is shifted to the left, it brings the friction clutch into action. When it is shifted to the right it releases the clutch and ring *B* does not yet touch cap *A*. By shifting it still further to the right, contact is made between *A* and *B*, and the friction between the two members will turn the machine over.

However, the pressure between the two members *A* and *B* is merely a direct pressure and not to be compared to the great pressure which holds the members of the friction clutch together when it is normally operated. The direct pressure is sufficient to turn the shafts of the machine, but not sufficient to overcome any great load or to cause accidents. This right-hand movement of member *B* may be the result of a movement of the shifter lever, or it may be operated separately by means of a treadle. As a rule, this latter construction is to be preferred, as it leaves the hands of the operator free for the manipulation of the gears.

First Progress Report on Gage Steel Investigation

The first laboratory work undertaken has been to determine the reliability of the Amsler wear test machine. This work is being conducted by Mr. Freeman and his assistants in the Metallurgical Division. Tests disks for this machine of SAE 1020 steel case-hardened and SAE 1090 steel hardened were made up by Pratt and Whitney Company. The case-hardened disks flaked in the machine and were consequently not suitable for determining its performance. As it is difficult to harden carbon tool steel uniformly, an oil-hardening steel, "Ketos," was made up into disks, hardened and used for preliminary tests of the machine. Difficulty was encountered in aligning the machine, but this has been corrected. However, sufficient data are not yet available to report definite results.

As the progress of the wear tests has been rather slow, arrangements have been made with Dr. Mathews, of the Crucible Steel Company, to get a supply of 1.10 carbon — 1.40 chromium-steel for hardening experiments and wear tests and of 0.45 carbon steel for testing the wear of hard disks against soft. As the chromium bearing steel is at present the most universally used gage steel, it is planned to make the most elaborate tests on it.

While waiting the receipt of appropriate steels for the study of hardening problems, some quenching experiments have been made to determine the characteristic curves, cooling power, and reproducibility of the common quenching media. This was accomplished by finding calorimetrically the average temperature of a standard nickel cylinder after different times of immersion in the quenching bath. Cooling curves were thus obtained for quenching in water at 30 deg. C. with and without motion of the cylinder, for quenching in oil at 30 deg. C. without motion and with slow and fast motion of the cylinder, for quenching in oil at 10 deg. C., 100 deg. C. and 200 deg. C. without motion of the cylinder, and for cooling in still air. The problems in heat treatment are being investigated by Mr. Scott assisted by S. S. Kingsbury of the Metallurgical Division.

Mr. French has varied the heat treatment of several steels in the form of 4-in. cylinders, similar to those recommended by the committee, with the principal object of determining the effect of rate of heating on the dimensional changes. Some of these cylinders showing large dimensional changes on hardening are being measured for time changes. The length measurements are being made under the immediate direction of Mr. Miller of the Gage Section. This section has also prepared an attachment to the millionth comparator to take 4 ± 0.003-in. blocks for measuring the changes on hardening and with time. The attachment includes an oil bath in which the specimens are partially immersed to secure temperature uniformity.

Encouraging Suggestions

By Frank V. Faulhaber

Machine shops that have tried to encourage their employees to send in suggestions have not always received the large number of ideas possible because some men will not bother to offer their suggestions on letters to be dropped into a box. As one executive explained: "Some employees will never think of suggesting some new improvement unless you absolutely ask them individually to do so. We find that many good ideas are not sent in to us as a consequence."

There is a good idea, however, available for machine shop executives who desire more suggestions and ideas from their employees. The example comes from a factory in another industry that has been bringing about good results with what is termed "report cards." The owner explained the system: "We distribute these cards every day, without exception, to all of our employees and our executives. Some men are timid and naturally hesitate to offer their opinions regarding a possible improvement. Then there are some individuals who have the thought that their ideas would not be used anyway and others, we have noticed, who must be prodded to get any ideas from them. The report cards have solved this problem."

As suggested, the cards are distributed daily and they are collected at the end of each day. Thus, each employee will want to do his share, for there are the cards to go by and they, naturally, furnish the necessary influence and encouragement.

Application of the Welding Torch to Railroad Repairs

Welding Torch Reduces Cost of Repairs—Locomotives Need Not Be Dismounted—Salvage of Many Small Parts Possible—Cutting Instead of Forging

SPECIAL CORRESPONDENCE

THE discovery of the possibilities inherent in the oxy-acetylene flame and the practical application thereof to industrial purposes through the medium of cutting and welding torches, may well be ranked among the most important and revolutionary steps in the progress of industrial art. This flame is to the mechanic what the scalpel is to the surgeon, inasmuch as it enables him to reach and if necessary reconstruct vital parts that were hitherto inaccessible.

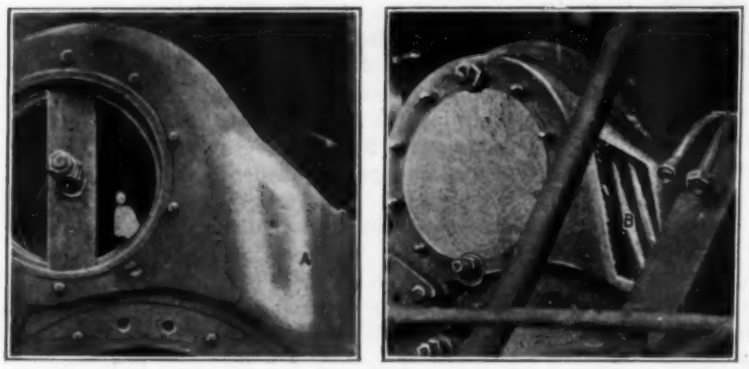


FIG. 1.—WELDING BROKEN WALL IN STEAM PASSAGE

Though it may be a far cry from the disciple of Æsculapius to the wielder of the acetylene torch, the work of both is, nevertheless, along similar lines. The diseases of modern intricate machinery, like the diseases of men, are more than likely to be deep-seated and beyond the reach of superficial ministrations. In no class of machinery is this more true than in the locomotive, for in this ponderous piece of mechanism there are many vital parts concealed under its expressionless exterior that are subject to deterioration or destruction by reason of wear, corrosion, shock, vibration, exposure to extreme temperatures and many other causes, and it is the welder's duty to reach and restore these affected parts by cutting away the enclosing shell when necessary, and afterwards replacing it so that it may resume its normal functions.

As the life of the patient may depend upon the skill of the surgeon so may the lives of hundreds of perfectly healthy persons be dependent upon the skill of the welder, for should one of these mighty machines fail upon the road at a critical moment, not all the surgeons in the world could restore to order the havoc that would be wrought.

The New York, New Haven & Hartford Railroad has within the past three years adopted and put into extensive use this extraordinary means of locomotive repair and in this article will be shown a few of its applications to the salvage and reconstruction of machines that would without it demand complete rebuilding, or perhaps be continued in service with the true nature and serious aspect of their disabilities unsuspected until disaster resulted.

Though this road has applied the acetylene method of restoration to many locomotives, some of which have been in regular service for over two years since the repair was made, not once has a welded part failed in service; and, though welded parts are every day tested to destruction in their physical laboratories, it is always the sound metal and not the weld that yields.

An example of interior repair that is analogous to the work of the surgeon is shown in Fig. 1, where to reach the affected part it was necessary to cut away and afterwards restore the enclosing shell. The machine is one of the huge Pacific type of locomotives drawing the express trains in which you and I may any day be riding, unconscious of the delicate surgical operation that has enabled it to transport its valuable cargo in safety.

The cylinder, valve chamber, steam chest and one-half of the saddle are all comprised in a single casting with the ports and passages cored within it. One of the thin walls of cast iron that separates the live steam at 200 lb. pressure from the exhaust had become cracked or broken, probably by freezing, and allowed the steam to blow through, thus putting the engine out of business.

To repair the affected part it was necessary to cut out a panel, as at *A* in the outer shell, cut away the broken wall, weld in a new piece and then weld the panel back in place. The panel was cut out by drilling a series of holes in the form of a rectangle of sufficient size to enable the welder to reach the work upon the broken wall. The affected part was then cut away with a chisel along the line of the break and a new piece welded in. The white lines at *B* show the weld. The panel in the outer shell was then welded in as at *A*,

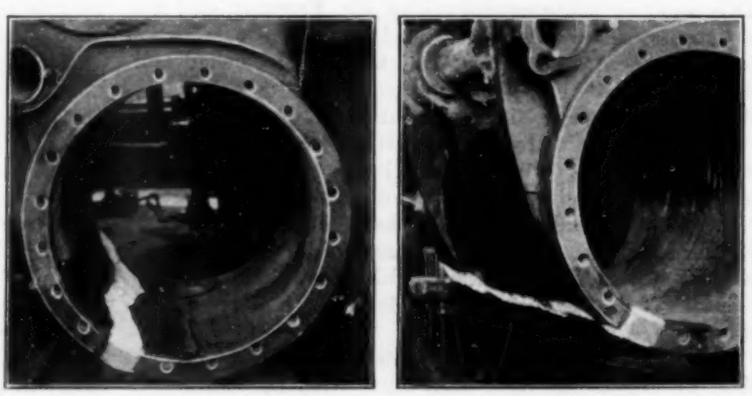


FIG. 2—A CRACKED CYLINDER RESTORED

FIG. 3—A JOB OF "INSIDE WORK"

FIG. 5—REPAIRING CRACKED FLANGES OF CYLINDERS

this view showing the completed job. The small hole in the center of the panel was drilled and tapped for an eyebolt by means of which the loose piece could be handled. This hole was finally closed with a pipe plug.

In another engine of the same type one of the cylinders developed a crack throughout the entire length near the bottom. To make the repair and avoid the expense of a new casting, which, by the time it had been machined and assembled on the engine would have cost nearly two thousand dollars, the bushing was drawn out and with the aid of air hammer and chisel the cast iron wall was cut away along the inside of the cylinder in the shape of a wide V-groove, following the crack.

With the welding rod and torch this groove was then filled up, fusing the old metal with the new until the cylinder was restored practically to its original strength and contour. The portable boring outfit was then set up and a light cut taken through the cylinder, a new bushing fitted, and the engine was again ready for service with but little loss of time. Fig. 2 shows the completed weld before the cylinder was rebored.

An experiment that has been tried out successfully in joining the broken edges of important parts is shown in Fig. 3, where the joint had been but partly prepared for welding when the picture was made. Here again it was necessary to take out a panel to do some "inside work," though in this case the original break had gone far toward its removal by extending along two sides of the piece that had to be taken out.

This part, which when joined to its mate is known as the saddle and is called upon to bear the weight of the forward end of the boiler, is an integral part of the cylinder casting and to replace it would, of course, involve an entire new cylinder. The experiment referred to is the setting of small square or hexagon head tap bolts into the beveled edges that have been prepared for the weld, screwing them tightly into the iron. A double row of these small heads may be seen along the horizontal part of the break that extends back under the boiler.

In the welding process the heads are fused into the new metal and the bodies of the screws into the original casting, thus forming small anchors that are supposed to assist in holding the edges together.

In Fig. 4 may be seen a welding job that was done upon the cylinder of one of the large freight locomotives. A part of the casting had been broken off by impact, exposing the steam passage and rendering the cylinder useless. A casting was made to conform to the shape of the broken part and this was welded to place without difficulty. The cut shows the job before and after welding.

Minor cracks in the flanges, often caused by water getting into the cylinder while the engine is moving, are easily closed and the casting restored to its original strength and usefulness in a few hours, or in some cases minutes, thus saving the entire part from the

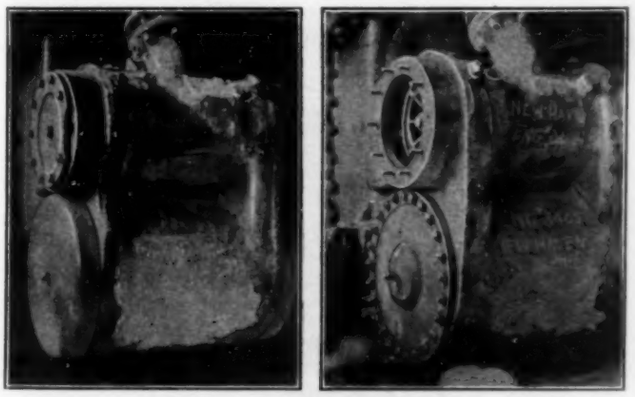


FIG. 4—BROKEN PART OF CYLINDER CASTING REPLACED

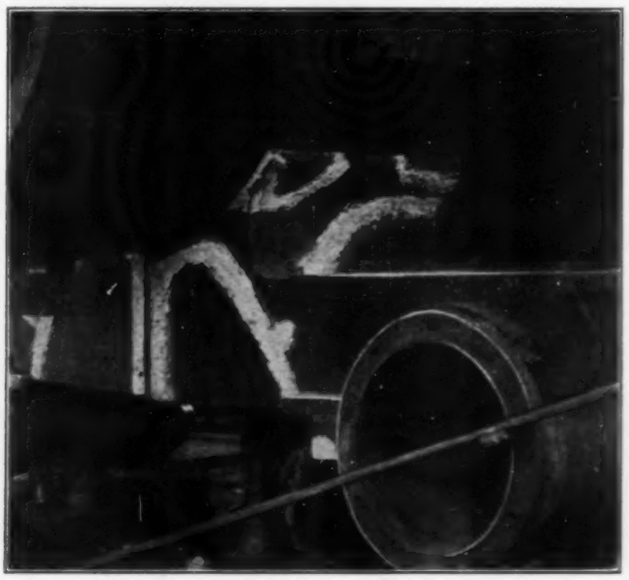


FIG. 6—AN EXTENSIVE REPAIR UPON A LOCOMOTIVE

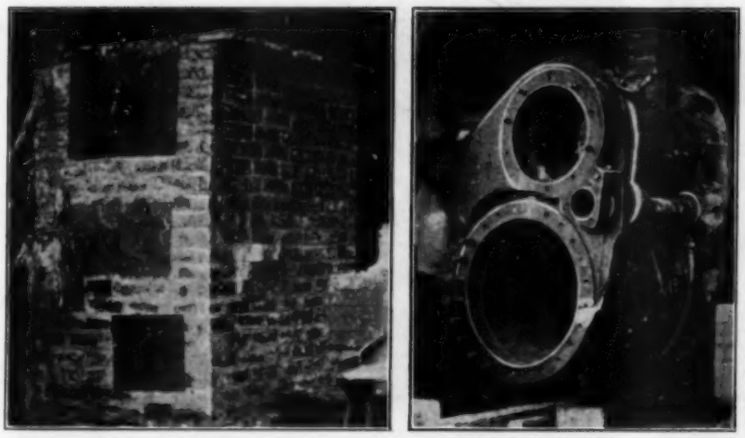


FIG. 7—A CAST-IRON WELD AND PREHEATING FURNACE

scrap heap and the engine from a long lay-over. Such a repair is shown in Fig. 5.

On another engine of a different type both parts of the saddle were broken in several places. Without the acetylene torch new castings would have been the only possible means of restoring the engine to service. The lines in Fig. 6 show the position and extent of the several breaks and indicate how the repair was made without dismounting the machine, and at a small fraction of the rebuilding cost. This is a freight engine and is now doing daily duty on the road.

The welding material used in all the foregoing operations is tobin bronze, and the art of handling this metal has been developed to a high state of perfection by the foreman in charge of welding operations for this road. Cast iron is also used as a welding material but the cost of such welds is usually much higher owing to the necessity for preheating the work, and the results are not equal in strength and dependability to welds made with bronze. In all the above described jobs there was no preheating and no prepartion other than chipping away the defective and corroded metal along the breaks.

The welds shown in Figs. 7 and 8 were made with cast iron and the elaborate preparations necessary are indicated by the presence of the furnaces shown in the illustrations. The cylinder castings were not removed from the engines, which stood upon the rails of the repair tracks, but the brick furnaces were built up in each case completely to enclose the cylinder, filled with charcoal and fired. Several hours were required to heat the job up to the requisite temperature, almost red hot, when the furnaces were torn away and the welds made. Besides the time and expense involved in preheating the work, the welder is handicapped by having to work in close proximity to the heated mass and cannot, therefore, work as efficiently as he might if the metal were comparatively cool.

Welds made with cast iron sometimes fail immediately—though the break is more likely to occur in the sound metal adjoining the weld than in the weld itself—because of shrinkage strains set up in cooling, and then the work has to be done all over again.

Locomotives are by no means the only things around a railroad shop that are repaired by welding. The foot plate of a derrick is shown in Figs. 9 and 10, broken in several places. This weld was made with tobin bronze, though the casting was preheated for the work. As it was an individual casting and required no dismantling it was taken to the welding shop and laid upon the "preheating box." Fig. 9 shows the casting on the box, where the welding was done. The combined length of the welds was 18 ft. and 100 lb. of bronze was used in the welding. The casting weighs approximately two tons and the operation of welding required 32 hr. In Fig. 10 the casting is shown suspended from a crane, where an idea of the extent of the welds may be obtained.

A badly broken cable drum is shown in Fig. 11. The rim was broken apart and four of the spokes were separated from the rim. Preheating was necessary in this case because of the shape of the casting, which would be likely to induce shrinkage strains that would again break the spokes as the work cooled.

In Fig. 12 may be seen a particularly exacting job of welding, not because of the difficulty of joining the parts but of the necessity for having the gear perform satisfactory service, after welding, without machining; otherwise there would have been nothing gained by having welded it. The gear was broken in four pieces, the breaks including a part of the rim. By means of clamps, trams and templets the broken pieces were

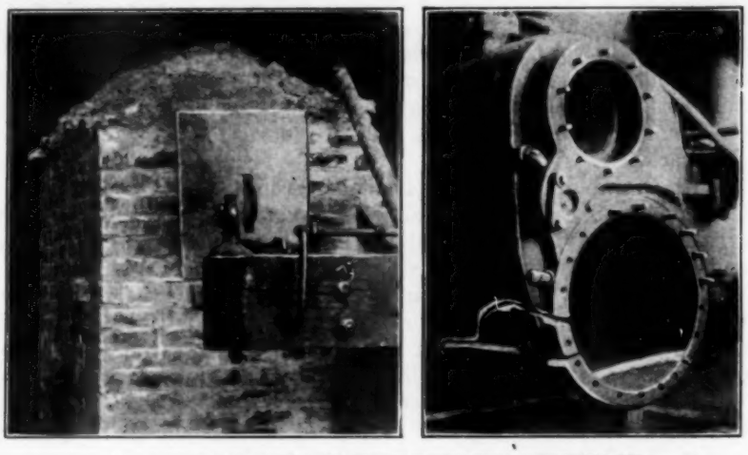


FIG. 8—PREPARING THE PREHEATING FURNACE

fitted together and welded so perfectly that no machine work other than what could be done with a file was needed to restore it to usefulness. The gear is nearly 6 ft. in diameter and is a part of a wheel lathe used in the shops.

A larger job of similar nature is shown in Fig. 13. In this case there was no break in the rim but preheating of the latter was necessary to forestall shrinkage strains. The preheating was done with the gas

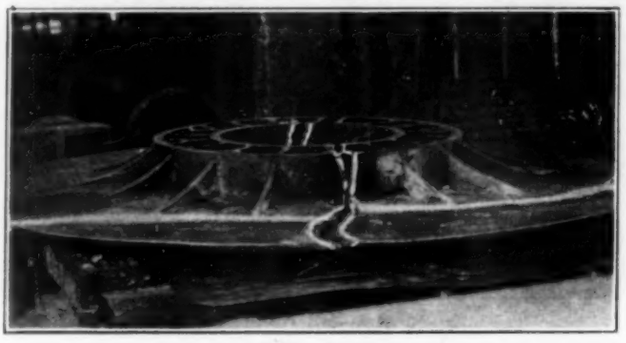


FIG. 9—FOOTPLATE FOR DERRICK ON PREHEATER BOX

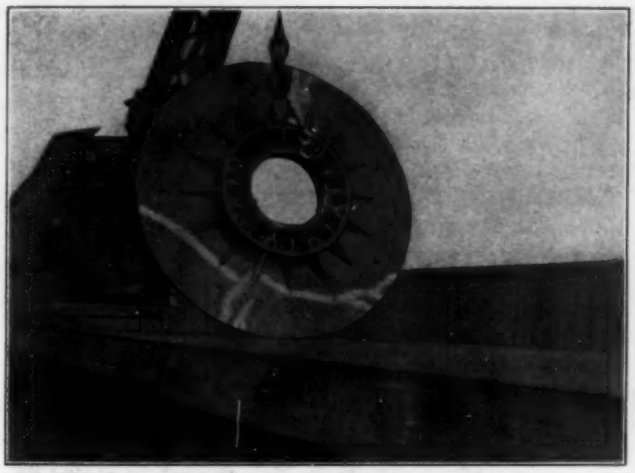


FIG. 10—THE COMPLETED JOB

ring that is used in the wheel shop for removing and resetting the tires of the driving wheels. It is shown in place in the cut.

Failures are rare, and when they do occur it is always during the cooling and consequent shrinking of the casting; never in service. The part shown in Fig. 14 is the foot plate of one of the road's wrecking derricks and is a very heavy casting. This weld was attempted with cast iron in the days before bronze was considered as a welding material and, though every precaution in the way of preheating was taken and repeated trials made, the ribs would pull away from the central hub in cooling. This job was, threfore, abandoned; but the foreman welder, under whose direction all the previously described work was done, is of the opinion that if this job should recur he would use bronze upon it with success.

Building up Worn Parts

Many of the smaller parts of locomotives, such as driving boxes, guide bars, pistons and piston rods, etc., that are subject to rapid wear are built up with bronze or soft steel and remachined ready for service, thus saving the expense of new forgings. On parts where little machine work is required a manganese bronze is used that resists wear much longer than the softer metal but does not lend itself readily to machine work.

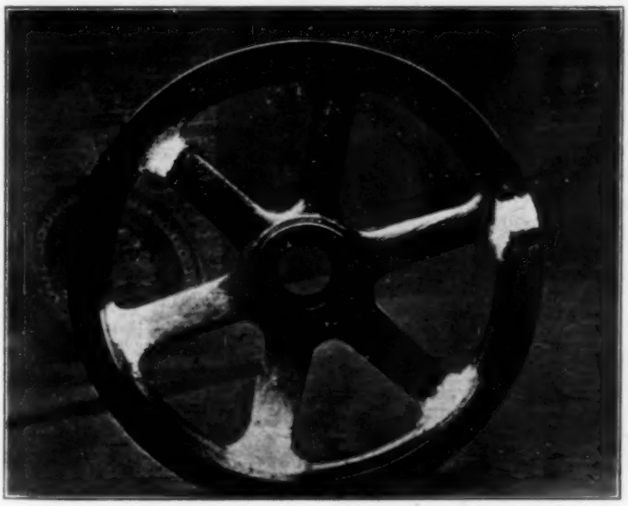


FIG. 11—CABLE DRUM REPAIRED BY WELDING

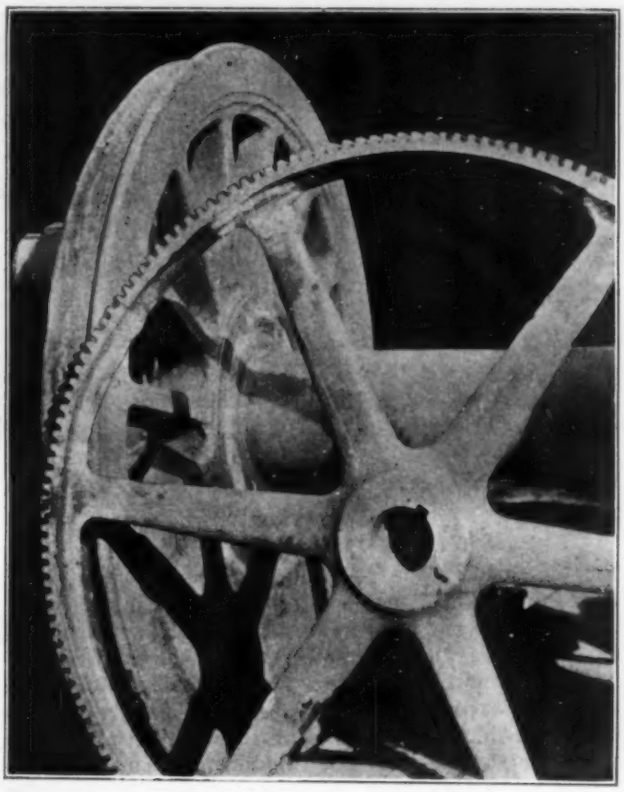


FIG. 12—AN EXACTING JOB

Cracked bells for locomotives are reclaimed by bronze welding, and, though the welder will not guarantee the same note, the bells will ring as clear and true as before the break. Some of the bells that have thus been reclaimed may be seen in Fig. 15.

A part that wears out rapidly is the elevator screw of the automatic stoker used on some of the larger locomotives. These screws, Fig. 16, convey the coal from the tender to the firebox. They are three in num-

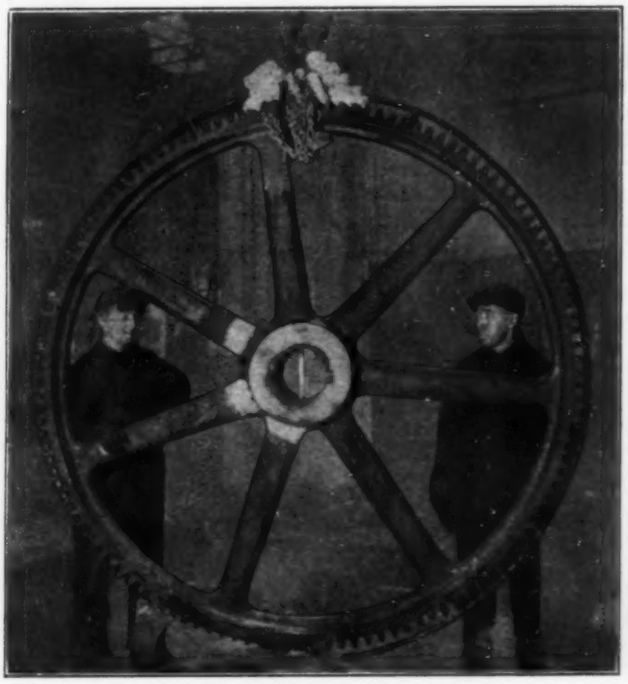


FIG. 13—A BROKEN GEAR RESTORED TO SERVICE

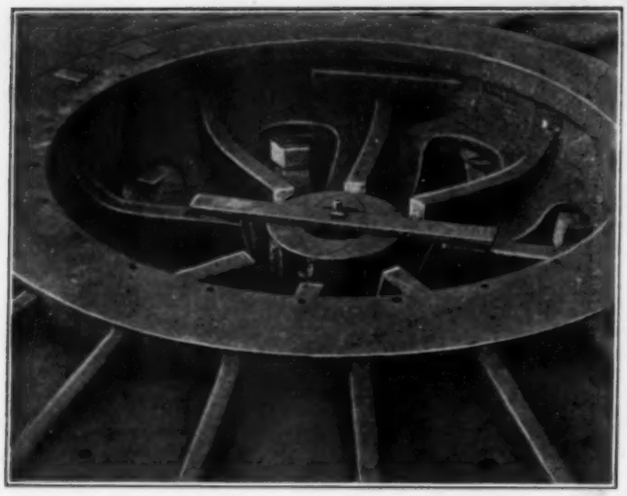


FIG. 14—A JOB THAT WAS ABANDONED

ber on each engine so equipped and as there is no machining upon them except grinding the journals they are made of very hard material. The constant passing of coal along the helix soon wears the edges sharp, in which condition they do not work satisfactorily and are liable to break. These edges are quickly restored to normal thickness by building them up with the torch, using manganese steel as a welding material.

The torch also plays an important part in the boiler shop. Plates may be cut out and new ones welded in, patches may be welded on, leaks stopped, refractory staybolts cut out, and many minor repairs made in a small fraction of the time that would be consumed by other methods. The use of welding is, however, somewhat restricted around a boiler shop by a law that demands riveted joints in certain places and the torch has not, therefore, completely banished the pneumatic hammer in this respect.

Cutting Torch Will Not Cut Cast Iron

In all the jobs here described only the *welding* torch has been considered. The cutting torch is of different construction and involves different principles. It is a peculiarity of the latter that may not be known to many whose experience does not bring them into contact with oxy-acetylene processes, that this torch will not cut cast iron. Therefore in preparing cast iron for welding, the cutting torch, with its slender finger of blue fire that cuts through the six-by-eight section of steel in a locomotive frame like a sharp knife through cheese, must be replaced by the pneumatic hammer and chisel.

That the torch will cut steel readily is evidenced

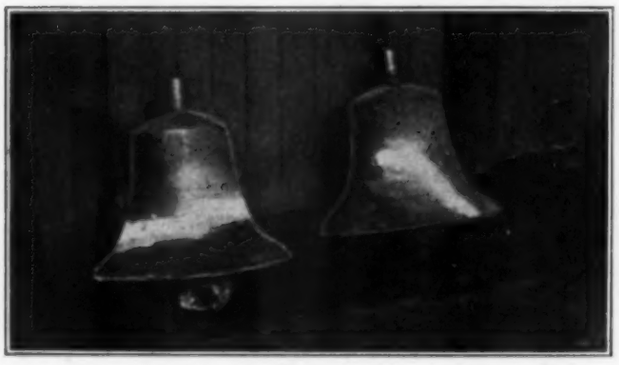


FIG. 15—CRACKED BELLS RECLAIMED BY WELDING

FIG. 16—EDGES OF CONVEYOR SCREWS BUILT UP WITH MANGANESE STEEL

by the side rod shown in Fig. 17 which was cut from the slab, including the round hole in one end, in forty

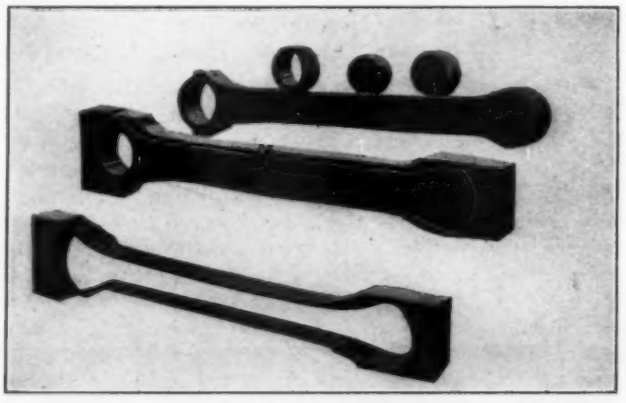


FIG. 17—AN EXAMPLE OF WHAT THE CUTTING TORCH WILL DO

minutes. The metal is 4 in. thick and so cleanly and squarely is the cut made that no machining of the cut surfaces is required for the finished part.

Retaining the Worker's Interest

By Robert Grimshaw

A temporary change of occupation may help to keep a man interested in his work if the set of operations he is doing proves too little monotonous.

"Too little monotonous" is what I said. The man who has a routine job calling for finger memory can let his thoughts wander fancy free, but the one who has to think of a dozen things is under a strain and should be given a monotonous job for a change.

FIG. 1. INSPECTING THE VALVES

FIG. 2. PISTON RING INSPECTION

A Few Marmon Inspection Methods

Showing Typical Inspection of a Few Parts of the Marmon Car Which Gives an Idea of the Care Used

SPECIAL CORRESPONDENCE

A FEW of the inspection operations in the Marmon plant are shown herewith. The valves are very carefully gaged as to size, straightness, angle of seat, etc., as shown in Fig. 1. The seat is tested for concentricity with the stem by the dial gage shown. The angle of the seat is inspected by the long gage with the side cut away, to be seen just above the micrometer. Each valve is carefully wrapped on passing inspection.

The inspection of piston rings is shown in Fig. 2. Here the thickness is inspected by such gages and the opening gaged when the rings are closed in on the form to be seen at the extreme left. The diameter of the rings before closing is indicated by the dial gage near the center. Valve spring tension receives careful attention as shown in Fig. 3, where the pressure exerted by each spring is weighed by a Toledo scale in connection with a special compressing device. The length is measured both before and after compression so as to determine the amount of the set.

The chassis springs also receive careful attention, every spring being tested by the pneumatic press shown in Fig. 4. The ends of the spring to be tested rest on a small car or truck so as to be free to move endwise as the spring lengthens under compression. Both the pressure required and the action of the spring are carefully noted.

FIG. 3. TESTING VALVE SPRINGS

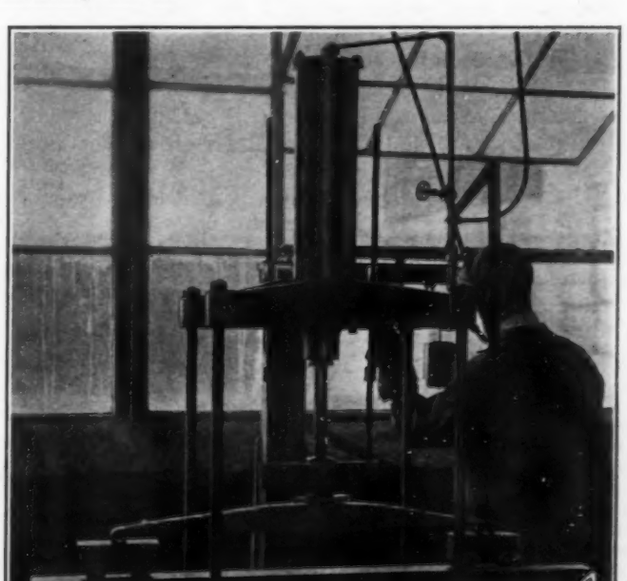


FIG. 4. PRESS FOR TESTING CHASSIS SPRINGS

Nickel and Its Alloys

The Second Article—Properties and Uses of Nickel-Silver and Monel Metal—How Monel Metal Should Be Melted, Cast and Forged

By PAUL D. MERICA
Director of Research, International Nickel Company

THE nickel-silver alloys are known in the trade under a variety of names such as german silver, white metal, arguzoid, electrum, new silver, platinoid and white copper. As shown in Table V, their composition is variable. They are produced chiefly in the form of sheet, wire and seamless tubes, but also in castings of a semi-ornamental nature, such as for automobile wheel hubs. Probably the chief use of nickel-silver is for table cutlery, such as spoons and fork stock to be silver plated. The metal is readily spun and drawn cold. For this reason and also because of its pleasing color and non-corrodibility, it is adapted to the production of numerous stampings and fittings.

The color and resistance to corrosion of these alloys improve as the nickel content varies from about 5 per cent in the cheapest ware to from 20 to 30 per cent in the best quality. Lead is added in stock such as key stock which is to be machined, in order to improve the machineability. The tensile properties and hardness vary, naturally, both with the composition and the temper of the metal. Table VI gives an idea of the properties of the typical nickel-silver alloys. During the cold working of these alloys by drawing or rolling, they may be softened by annealing, preferably in a muffle furnace with the exclusion of air at about 1,300 deg. Fahrenheit.

Commercial Forms of Monel Metal

The alloy known as monel metal is produced generally by direct smelting and refining of the copper-nickel bearing ores. It contains from 67 to 69 per cent nickel and from 28 to 29 per cent copper, together with about 2 per cent iron and from 0.5 to 2 per cent manganese and carbon, according to the use to which it is to be put. It is produced in the usual commercial forms as follows:

Hot-rolled rods contain about 2 per cent manganese and about 0.2 per cent carbon.

Cold-drawn rods are identical in composition.

Hot-rolled, bright annealed sheet contains about 0.25 per cent manganese and 0.10 per cent carbon.

Cold-drawn wire contains about 2 per cent manganese and about 0.15 per cent carbon.

Cold-drawn strip is similar to wire in composition.

Welded tubes are fabricated from the sheets.

Monel castings are similar in composition to the rods, but often contain some silicon.

TABLE V. COMPOSITIONS OF NICKEL-SILVER IN COMMERCIAL USE

Material	Nickel Per Cent	Copper Per Cent	Zinc Per Cent	Lead Per Cent
Cutlery and knife stock	15 to 25	55 to 65	14 to 20	Fe. 0.5 to 1.5
Key stock	8 to 18	55 to 65	15 to 35	1 to 2
Jewelers' wire	5 to 25	53 to 63	25 to 32	.....
Brazing solder	8 to 20	35 to 40	40 to 55	.....
Watchcase metal	10 to 28	55 to 65	16 to 30	0 to 1
Spoon and fork stock	10 to 20	57 to 66	20 to 30	.....
Platers' bars and cores	5 to 25	56 to 70	18 to 24	.....

Besides these forms, monel metal is on the market in fabricated forms such as, screen and wire cloth, chain, wire rope, sash cord, rivets, screws, bolts and nuts, tacks, nails, balls, knives and forks.

Table VII describes some of the physical properties of monel metal. The principal useful properties are resistance to corrosion, a white color and a high polish which the metal will take and retain, mechanical strength and toughness which is retained even at high temperatures, and resistance to steam erosion. These properties are illustrated in the commercial applications of monel metal described later. In further illustration of the remarkable toughness of this metal, the results of the recent Bureau of Standards tests may be cited. It was found from the Izod and Charpy impact tests that a notched bar of hot-rolled monel metal required about 150 ft.-lb. of energy to break it, compared with the 50 to 100 ft.-lb. required to break the heat-treated alloy steels.

Remarkable Resistance to Corrosive Solutions

Monel rods and castings are used to a great extent in the construction of pickling tanks and crates for the pickling of steel. They resist for years the action of the 6 deg. Be. sulphuric acid used in pickling at about 150 deg. F., and in addition have the mechanical strength to carry the loads required.

Another large use of monel metal rods is for pump rods and liners, and for valves for handling mine and sea water and corrosive solutions generally. It has been found by test and experience that monel metal resists excellently the action of ammonia, ammonium hydroxide, fused and aqueous caustic alkalis, fatty and most other organic acids, sea water, solutions of neutral metallic salts such as alum, sulphates, chlorides, gasoline and mineral oils, phenol and cresols, photographic chemicals, urine, dry mercury, dyeing solutions and alcoholic beverages. It resists fairly well the action of sulphuric, weak phosphoric, hydrocyanic, hydrofluoric, acetic, and citric acids, ferrous sulphate and dry chlorine. It is not resistant to the action of hydrochloric, fused or aqueous chromic and nitric acids, molten zinc, potassium cyanide, sulphurous acid and ferric chloride.

Monel sheet has been used for roofing, as, for example, for the roof of the Pennsylvania Terminal in New York.

TABLE VI. TENSILE PROPERTIES OF COPPER-NICKEL-ZINC ALLOYS

Strip	Tensile Strength Lb. Per Sq.In.	Elongation In 2 In. Per Cent	Composition Per Cent Nickel	Copper	Zinc
Hard	130,000	2	30	47	23
Annealed	73,000	32	30	47	23
Annealed	71,000	38	25	55	20
Hard	94,000	2.5	18	64	18
Annealed	58,000	33	18	64	18
Hard	107,000	2	18	55	27
Annealed	69,000	29	18	55	27
Hard	92,000	4	10	62	28
Annealed	63,000	48	10	62	28

TABLE VII. PHYSICAL PROPERTIES OF MONEL METAL

	Tensile Properties				Hardness	
	Yield Point 1,000 Lb. Per Sq.In.	Tensile Strength 1,000 Lb. Per Sq.In.	Elongation In 2 In. Per Cent	Reduction of Area Per Cent	Scleroscope Universal Hammer	Brinell 10 mm. Ball 3,000 Kg. Load
Sheet or strip						
Annealed	25 to 35	70 to 80	35 to 45	50 to 60	15 to 20	100 to 120
Cold-rolled	110 to 120	120 to 130	2 to 5	.....	40 to 50	250 to 350
Wire						
Annealed	.....	70 to 80	.....	.....	.....	.....
Cold-rolled	.....	110 to 150	.....	.....	.....	.....
Rod						
Hot-rolled	35 to 60	80 to 100	30 to 45	50 to 65	20 to 30	145 to 170
Cold-drawn	60 to 80	80 to 100	30 to 40	50 to 65	.....	180 to 200
Casting	25 to 40	65 to 75	25 to 40	.....	.....	.....

Density: 552 lb. per cubic foot or nearly equal to that of copper.
Melting point: about 2,420 deg. F.
Coefficient of thermal expansion: 0.0000081 per degree F. (from 60 to 210 deg. F.), or just over that of steel.
Electrical resistance: 256 ohm per mil. ft. at 75 deg. F. or about 25 times that of copper.
Temperature coefficient of electrical resistance: 0.0011 per degree F.
Magnetic properties: weakly magnetic up to about 250 deg. F.
Optical reflection: 60 per cent compared with 95 per cent for polished silver and 55 per cent for polished steel.
Young's modulus of elasticity: 25,000,000 lb. per square inch.
Properties of hot-rolled rods depend on their size. Their proportional limit is about 80 per cent of the yield point and varies from 30,000 to 45,000 lbs. per square inch.

It is used largely in the construction of washing machines, dairy machinery and tanks, perforated mine screens and chutes, vat and tank linings for alkalis and acids, and for many household utensils.

The relative incorrodibility of monel metal, its resistance to the eroding effect of steam and its strength at high temperatures have made a unique place for it in the superheated steam field. Turbine blading and valve stems and seats for superheated steam are today largely made of this metal. For such purposes monel metal is well fitted because its thermal expansivity is nearly equal to that of steel, with which it is usually associated in valves for turbine construction. Fig. 4 shows a monel metal steam valve with a cast monel body and a monel trimmed rod.

Although monel metal is used for a great variety of additional purposes, the foregoing instances are typical of the general scope of its application in industry. The metal is not marked by an extreme resistance to corrosion (such as is platinum or gold, for instance), so much as it is by a relative incorrodibility together with valuable mechanical and other physical properties. To use an every-day term, it might aptly be called a "general utility" non-corrosive alloy.

Monel metal can be fabricated by essentially the same methods as are used in the fabrication of steel, but it differs from steel in some important particulars of its behavior.

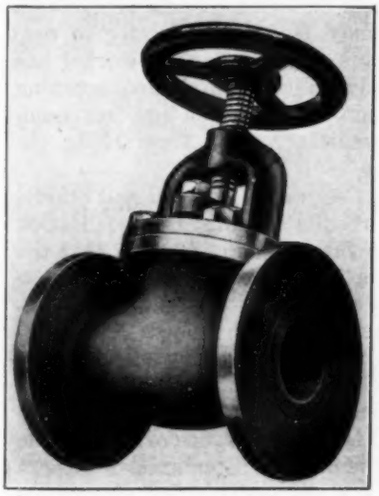


FIG. 4—VALVE WITH CAST MONEL BODY

Although monel metal is a non-ferrous metal, the melting and casting of it conforms more closely to the steel foundry practice than to the casting of brasses and bronzes. This is evident from the fact that its melting point is about 2,500 deg. F. and that, depending upon the type of casting, it must be poured at from 200 to 400 deg. higher than that temperature.

The metal may be melted either in crucibles or in a reverberatory or electric arc furnace, and ingots or shot may be used together with foundry scrap. The usual precautions must be taken to prevent the metal from becoming over-oxidized. The most important feature in the melting operation is to finish it with the metal at the right "pitch," namely, with the proper carbon content. For casting, this carbon content should be not lower than about 0.10 per cent and not higher than about 0.35 per cent. It may be necessary to add flour carbon or charcoal with the charge in order to finish the melting with this amount of carbon. A good composition for casting contains about 2 per cent iron, 1 per cent manganese (added as ferro-manganese), 0.5 per cent silicon (added as ferro-silicon), 0.20 per cent carbon and the balance of nickel and copper.

Before pouring the castings, the metal should be deoxidized by the addition either in the ladle or in the crucible of 1½ oz. of metallic magnesium to every 100 lb. of metal. This magnesium is held with tongs and plunged to the bottom of the ladle, where it is held until the magnesium has dissolved. If the metal is at the

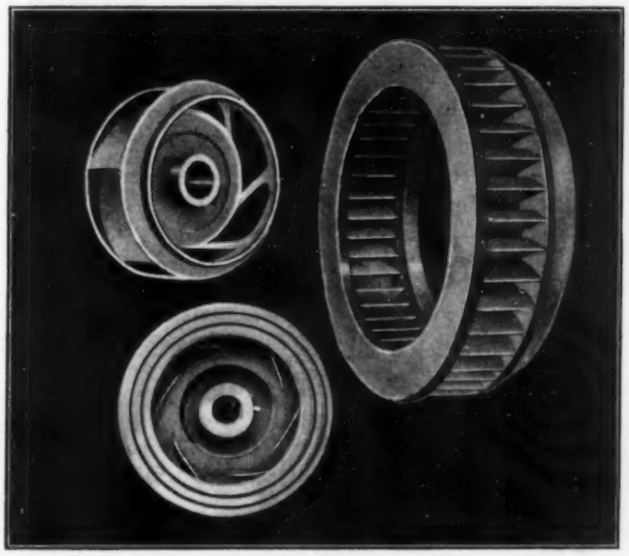


FIG. 5—IMPELLER CAST OF MONEL METAL

right pitch, this operation will proceed quietly and with no difficulty.

The molding and gating practice with monel metal is very similar to that used in the casting of steel. Molds should preferably be baked, but may merely be skin-dried. The shrinkage of monel metal is ¼ in. to the foot, so that heavy risers are necessary in order to feed the casting properly. Figs. 5 and 6 show turbine impellers and pump cylinder castings made of monel metal.

Except in a few important particulars, monel metal may be forged in the same manner as medium carbon steel. However, certain precautions are absolutely necessary in order that the forging may be successful. In the first place, the temperature at the beginning of the operation should be not over 2,050 deg. F. and not under 1,850 deg. F., and the work should not be continued beyond the time at which the temperature drops to about 1,400 deg. F., or when the metal becomes a dull orange color. If monel metal is heated above 2,100 deg. F., it is likely to become hot-short and to crumble readily under the hammer.

Not only must the forging work be carried out at the correct temperature, but the heating must be conducted in such a manner that the metal is not oxidized nor contaminated by sulphur from the fuel. The oxide or scale of monel metal adheres tightly to the metal and is not knocked off in the manner that steel scale is, but is worked into the surface of the forging. It is therefore necessary to prevent this scale formation by heating the metal in a neutral or slightly reducing atmosphere. Furthermore, even in a reducing atmosphere such as a smoky flame or in the blacksmith's forge, the metal will readily absorb sulphur from the fuel. This sulphur embrittles the surface of the billet in such a

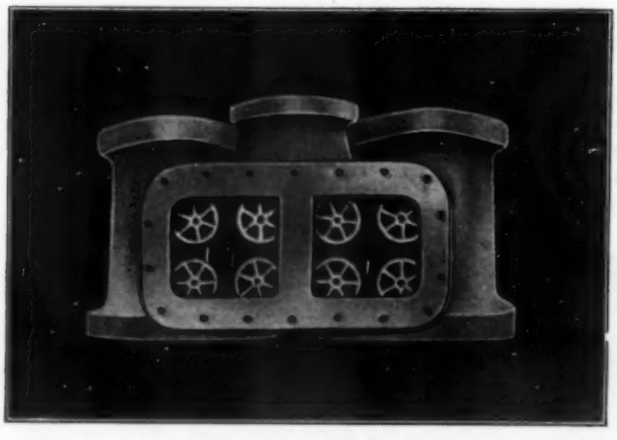


FIG. 6—MONEL PUMP CYLINDER CASTING

way that, in subsequent forging, the surface checks and cracks in a very characteristic manner.

In order to avoid oxidizing or sulphurizing, therefore, it is preferable to heat the metal in a muffle type of furnace if possible, and if not, in an oil- or gas-fired hearth furnace using fuel that is free from sulphur. In no case should the heating be carried out in a blacksmith's forge, as the metal will certainly be contaminated and cracked when the attempt is made to forge it.

Forging should be done with the hammer, as this means has been found much more successful than the use of any of the usual types of presses. This condition is possibly due to the fact that the metal retains its heat better under the hammer than under the press.

Monel metal is successfully drop forged with the use of tool-steel dies. The most important feature in drop forging this metal is the proper design of the dies. In

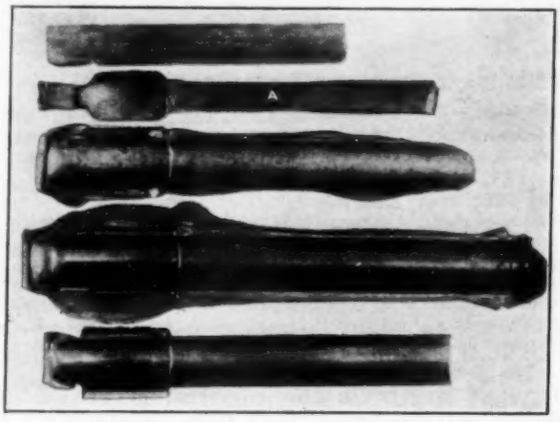


FIG. 7—DROP FORGING A TURBINE BLADE FROM A MONEL ROD

general, the dies should be cut in such a manner that the principal distortion in any operation will always occur in the thickest part of the forging, as this part retains its temperature the longest.

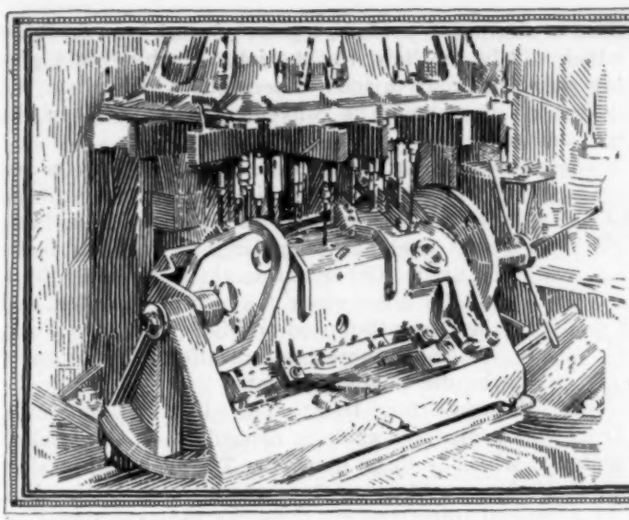
In Fig. 7 are shown the steps in the drop forging of a monel metal turbine blade from 1-in. square hot-rolled monel rod. In the first heat the rough forging *A* is produced. It is then reheated, finished and trimmed in one heat.

Oil Infection

BY GUS HAESSLER

During the past year several articles have appeared in the *American Machinist* relative to oil systems used in manufacturing plants. Systems, more or less complete, were described and the effect of various oils in pure and impure states upon machine bearings and cutting tools were analyzed. Nevertheless there is one phase of the subject, namely, oil as a carrier of infection, that seems to have been mentioned only briefly and dismissed without the consideration to which the subject is entitled. Industrial medicine reports many cases of skin infection that may be traced directly to contaminated oil. As a means of protection the worker has the choice of painting the hands with iodine, wearing gloves or quitting the job, all of which imposes needless expense and inconvenience, aside from being objectionable.

The reports from the Peerless Motor Co. and others, page 127, Vol. 57, show results obtained by sterilization are sufficient evidence to justify the conclusion that the oil may become infectious. Moreover, the disappearance of the troubles of those affected, after the oil is sterilized, indicates the proper course to follow. The foregoing conclusions may be verified by any one in daily contact with tainted oil by changing to a no-oil job for a time. It is then possible to observe the effect of the contagion fade away and the reappearance of the trouble by simply returning to the oil job. Sterilization attacks the problem at its root and oil systems that do not include this process should be regarded as hardly in step with modern sanitary engineering practice.



Tool Engineering

By
Albert A. Dowd and Frank W. Curtis
President and Chief Engineer
Dowd Engineering Company, New York City

Design of Cutting and Shaping Dies Begun—Principles of Blanking Dies—Points of Design—Construction of Dies and Punches

SHEET metal is cut, pressed and formed into innumerable shapes by means of dies of various kinds. There are two general classes of dies, those which cut and those which shape. Cutting dies are used to punch or cut out sheet-metal blanks of the required form from a piece of stock fed through the punch press. The shaping dies are used to produce forms which require the material to be bent, twisted or drawn out so that it is changed from its original flat shape. Combinations of cutting and shaping dies are often made in which the blank is first cut out to the required outline and then shaped to the form desired.

These two classes of dies are sub-divided into several distinct types which we shall treat separately to avoid confusion.

Dies for sheet metal are used on punch presses of various kinds, the punches and dies being held, respectively, in the ram and on the bolster of the press. Suitable provision for locating is made, so that alignment of punch and die can be accomplished without great difficulty. Fig. 440 shows a capacity diagram for a punch press of standard make. The various dimensions on bolster and ram are given, together with machine capacities, in order that the designer may be able to determine whether or not the work which he has in mind can be used on a given machine.

Use of Capacity Diagram

The bolster shown at *B* is an integral part of the punch press itself. The bolster plate *A* is fastened to the bolster, and on it a die-holder is suitably mounted. The bolster plate is sufficiently thick so that die-holders of various sizes can be fastened to it in a substantial way. It would be possible to fasten the die-holder directly to the bolster; but this is not commonly done because a change may be necessary from time to time and a great number of holes might eventually be drilled in the bolster, which would be a disadvantage.

The punch may be held directly in the ram *C*, or it may be secured in a punch-holder which fastens on the ram. The shank of the punch-holder can be slipped into the hole *E*, clamped by means of the block *D* and prevented from turning out of its correct position by a setscrew in the hole *F*. The practice varies somewhat on these matters in different factories throughout the country.

The designer should be provided with capacity diagrams of all punch presses which are to be used on the work, and should design his dies in accordance therewith. It is generally advisable to select a press of a capacity somewhat greater than the work for which it is to be used, as it is much better to put work on a machine of ample size.

Principles of Blanking Dies

All dies which cut the metal to a specified form from the flat piece are called blanking dies, although there are several varieties of them and they are combined with other dies in many cases. In order to bring out the principles on which this kind of work is based, we shall discuss the matter, giving very elementary diagrams in order to make the different points as clear as possible. The material from which the work is made usually comes in a strip or sheet, but occasionally in a roll. Thin and narrow work is most frequently handled in a roll, using either hand or automatic feed. The material is passed across the face of the die and under the punch so that when the press operates, the punch passes down through the metal and shears the stock, which passes into the die. The principle of blanking dies is illustrated in Fig. 441. The punch shown at *A* is held in the ram of the press, while the die *B* is secured in the die-holder on the bolster plate of the machine. The hole *C* corresponds in shape to the punch, but is a trifle smaller. This variation between the punch and the die is determined by the thickness of the stock. The diagram *D* shows a punch *E* and a die *F*. The stock or work is indicated at *G*.

In order to make clear the action of the punch in connection with the work and the die, three diagrams are shown at *H*, *K* and *L*. In the first of these the punch *M* is just coming in contact with the work *N*. In the diagram *K* the punch *M* has passed partly through the work *N*, carrying with it the blank *O* as shown. In the diagram *L* the punch *M* has passed completely through the work *N* and has sheared the blank *O*, which then passes down into the die. The diagrams shown here

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are purposely made in very simple form in order to bring out the principles used in blanking dies.

Before attempting the design of blanking dies, the tool engineer must consider carefully various matters which will affect the design. In order to bring out these points clearly, they are here itemized briefly and will be

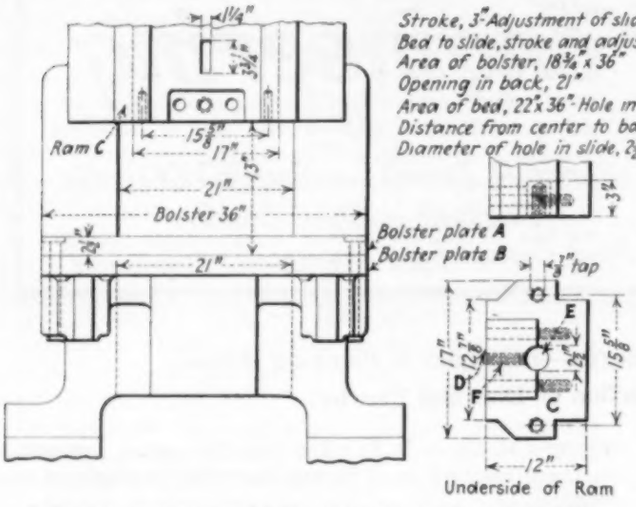

Stroke, 3" Adjustment of slide, 3"
Bed to slide, stroke and adjustment up, 13"
Area of bolster, 18¾" x 36"
Opening in back, 21"
Area of bed, 22" x 36" Hole in bed, 12" x 21"
Distance from center to back, 8½"
Diameter of hole in slide, 2½" x 3"
Ram C
Bolster 36"
Bolster plate A
Bolster plate B
Underside of Ram

FIG. 440—CAPACITY DIAGRAM FOR A PUNCH PRESS

dealt with more specifically during the progress of the article.

(1) Shape of Blank: The form which is to be blanked affects the die in several ways. If the work is plain and of regular outline an extremely simple layout may be all that is required. If the work is irregular, there may be several ways of positioning it in the die, and that one must be used in which there will be as little waste of the material as possible. Work which is to be blanked and pierced requires a different arrangement from that which is only to be blanked. The method of laying out the form of the blank will be taken up later.

(2) Thickness of metal: The design of dies is affected by the thickness of the material from which the blank is to be cut. For thin work and soft metal, a comparatively shallow die of light construction may be sufficient. For thick metal, both punches and dies must be much heavier in order that they will stand the extra strains imposed upon them. The clearance between the punch and the die, and the angular relief of the die are also determined by the thickness of the metal.

(3) Quantity Required: This is an important point in design, as it affects the entire layout and general construction of punches and dies. For a small number of pieces a die can be made without much regard to the upkeep, while for high production work the regrinding of the die and keeping it to size for a long time are very important factors. These matters should always be considered at an early stage in the design. For a very large number of pieces, the die may be either sectional or solid, these points being dependent considerably upon the shape of the work and the difficulty of manufacture or upkeep.

(4) Machine Used: In the selection of a punch press for a given piece of work the thickness of the metal and general characteristics of the work to be done must all be considered. The capacity of the machine must be sufficient to handle the work to good advantage, and it is better to use a machine somewhat too large than to attempt to perform a piece of work on a machine which will be too light for the job. Machine data giving capacities and various dimensions which affect the design of dies should be conveniently available to the tool designer.

(5) Automatic or Hand Feed: The work may be fed by hand or automatically, according to its nature. If work is to be made from "ribbon" stock an automatic feed would naturally be used. Other automatic methods of feeding for sheet stock can also be provided, and they are often used on high production work. Naturally these matters affect the design of the die to some extent.

(6) Material for Dies: The kind of material from which dies are made is dependent on the kind of material which is to be blanked. The ultimate production also has an effect on the material used in the dies. As a general thing, the die is harder than the punch, so that in case of an accident or a displacement during the process of manufacture the punch will be injured rather than the die. The reason for this is that it is easier to renew the punch than to make a new die.

Construction of Dies and Punches

We have demonstrated the method by which a piece of work is produced in a die, and it is necessary now to take up a number of points in connection with both punches and dies. When the blank passes through a simple blanking die, it causes a certain amount of wear on the shearing edges of the die. After a while this wear causes imperfect work, but before this stage is reached it may be necessary to grind the face of the die and probably also of the punch. Provision is made to take care of this regrinding in the design of both the punch and die. As previously mentioned, it is customary to make the punch softer than the die, as it is much easier to replace in case of breakage by a lack of alignment or from other causes.

Dies are always relieved to give clearance for the blank to pass through. The angle varies from ½ to 2 deg. Some manufacturers have a rule for a clearance

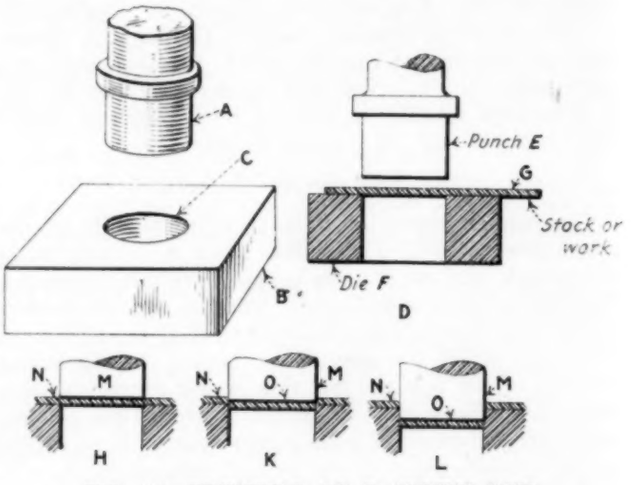


FIG. 441—PRINCIPLE OF BLANKING DIES

of ½ deg. for stock up to 0.125 in. thick, and ¾ deg. for stock thicker than 0.125 in. When a small number of pieces is to be made the die is often relieved with a greater angle than this, sometimes as much as 4 to 5 deg., as it is easy to make in this way. Common prac-

tice has established a more or less flexible rule that dies should be made with a clearance angle from 1 to 1½ deg.

Two methods of relieving a die are shown in Fig. 442 at *A* and *B*. In the example *A* the clearance extends to the top face of the die, there being no "land." When the die becomes worn the upper face may be ground off, and although this changes the size slightly on account of the angular relief, the variation in the blank is often not sufficiently great to cause trouble. There are some manufacturers who use this method very largely, depending on final shaving dies to retain the sizes. Others use a die made like the example *B* in which the portion *C* has no relief, the remainder being relieved to an angle as shown. A land from $\frac{1}{32}$ to $\frac{1}{8}$ in. is used, depending largely on the material and the diemaker's practice. Dies for very thin metal like soft brass often have no land at all, and if made with a very shallow taper they can be reground a number of times without altering their size sufficiently to cause trouble.

Clearance Depends on Metal Thickness

In fitting the punch to the die a certain amount of clearance is necessary, depending on the thickness of the metal which is to be blanked. It is common practice to rough out the punch very closely to the size which has been scribed on the end of it from a templet produced in the die. After this has been done, the final size is produced by shearing the punch directly in the die. An additional amount is then taken off the punch to provide for clearance. In the example *D* a punch is shown at *E* directly above the die and ready to be sheared.

It is not customary to provide the punch with any back clearance or relief, although there may be cases where it might be made like the example shown at *F*. Generally speaking, no relief of this kind shoud be made on a punch. The example at *G* illustrates the clearance between the punch and die, as indicated at *H*. This clearance is entirely governed by the thickness of the metal in the blank and the nature of the material which is to be punched. Soft and thin materials require less clearance than do harder or thicker metals. Tables which specify the clearances necessary for different qualities of materials can be referred to as a guide in proportioning the punch.

In order to make sure that the material is in its proper position on the die, one or more guide plates are generally used. Stock from which the blanks are to be

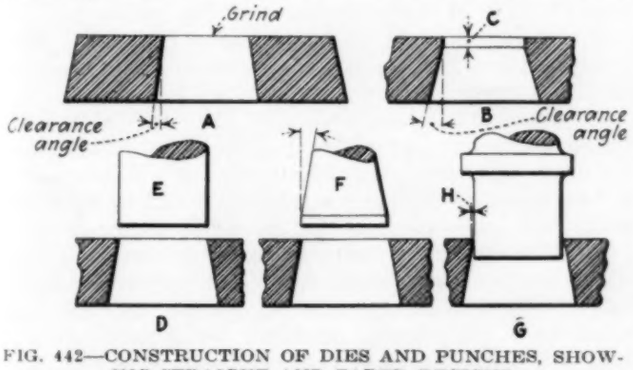


FIG. 442—CONSTRUCTION OF DIES AND PUNCHES, SHOWING STRAIGHT AND TAPER DESIGNS

made is fed through the press either by hand or by automatic feed. It may be in a sheet or in ribbon form, as previously mentioned. In order to illustrate the methods in common use, several diagrams are shown in Fig. 443. In the example *A* the die is shown at *B* and the punch at *C*. The guide plate *D* is at the rear of the die. The work *E* is held against the guide plate by the operator, and after each stroke of the press it is fed along the required distance and kept in position against

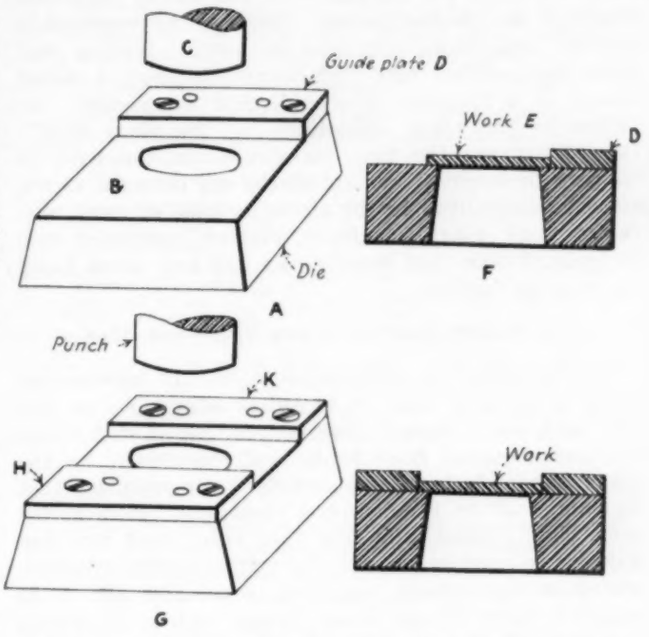


FIG. 443—GUIDE PLATES USED ON BLANKING DIES

the plate. The sectional view *F* illustrates these points very clearly.

In the example *G* two guide plates are used at *H* and *K*, and the stock is fed between them instead of being held against a single plate. There is always a certain amount of clearance necessary between the guide plates and the stock when two plates are used. The examples shown in the illustration on this page are intended simply to bring out the principle used in guiding the stock through the press.

Sources of Labor

By Robert Grimshaw

If it is desirable to know where one can buy asbestos, or phosphor bronze, sea island cotton or fireproof cement, it is equally desirable to know where to apply for labor in each of the various classes usually employed, and of those likely to be employed in an emergency or in a lively season. Thus, in a shipyard a number of "huskies" may be needed for only a few days, at a launching. Or one may want to know where to get a steeplejack or a flanger, a spot riveter or a number of carpenters.

The name of each applicant for a position of any kind, if he seems at all adaptable, should be entered on a card with a statement of all the details desirable in connection with his work, and, of course, with his house address and telephone number, if he has one. These cards should be arranged alphabetically in regard to family name. A duplicate set should be made by occupation and should contain the names in the first set, graded according to the supposed technical value, so that name after name under each occupation can be found in the first-named list.

The Men and Boys in Our Shops

By A. London

Being a constant reader of the pages of *American Machinist*, I was naturally attracted by the excellent contributions in vol. 56, pages 432 and 443 of *American Machinst* on "A Simple and Practical Apprenticeship System," and "Administration Methods." Having read those two articles with considerable interest, I asked myself as a foreman of considerable experience: (a) "What is the right education for the shop man?" (b) "What are the best incentives for the boys to improve themselves?" I am giving my personal views, and as I have lived in the shops as long as most men (some forty years) as fitter, erector, machinist and foreman, I hope that these views will help some along the road to success.

The Right Education for the Shop Man

It is my object to differentiate distinctly between the value to a shop man of technical education, on the one hand, and a logical and practical use of that which one has acquired from books and experience, on the other hand. It is an acknowledged commonplace that we cannot all be foremen and managers. It is at the same time emphatically true that every man who has a desire to excel, whether he be a fitter, erector, turner, plater or coppersmith, possesses a valuable ally if he makes a habit of acquiring various bits of knowledge and learns how to use them.

There is no finality in this profession of engineering. It is ever evolutionary and progressive, yet there are basic facts and fundamental principles connected with every phase of the mechanics' art which are unchangeable. These physical fundamentals are valuable assets for the shop man, and during more than forty years in the shops as apprentice, fitter, erector, machinist and foreman, I have proved their value.

Benefits of Home Study

There is not a class of the artisans mentioned who would not be directly benefitted by a home study of technical knowledge, accompanied by its practical application to the work done in shops. How many erectors of engines, boilers and heating systems know anything about the mechanical equivalent of heat, latent heat of steam, convection, point of saturation, relative volume, and superheat? And would not the erector of pumping systems benefit from a familiarity with the simple fundamentals of pneumatics, hydro-statics and hydraulics? All of these are interesting and absorbing subjects. Those whose work is to take charge of the erection of wood-drying plants and blast production would find their work doubly easy, if it were supported by the confidence arising from a knowledge of the laws of the exchange of heat.

Then come down to the shops. The fitter and liner-off in a large works is in a position to make or to mar the success of any machine-shop with which he may be closely connected. Unless he possesses a workable familiarity with geometry, angular measurements and trigonometry, his work, beside taking far too long and being of questionable accuracy, is usually a burden to himself. A knowledge of these things, even of an elementary nature, makes his job easier and his work less expensive and fully dependable.

In my experience as foreman, I have found that an apprentice who has acquired the knowledge referred to is more to be depended on for a difficult lining-out job than nine out of ten of the ordinary fitters around the shop. I have occasionally taken bright boys off the lathe, and they have been able to do a job of lining-off in about the time it would take the average shop man to get started. Shop managers quickly recognize the man who thinks mathematically, and we see the result in accurate work, saving of time, and lessened burden on the busy foreman.

To the coppersmith who has to take notes on outside work, a knowledge of drawing is of the greatest value. A case came under my personal notice a short time ago of a coppersmith who had been sent from Shiphams of Hull to take particulars for a set of piping for a steamship. He came provided with a bundle of ¼-in. diameter mild steel rods, with the aid of which a squared-paper sketch book and a rough protractor, he took notes and made rod templets for every pipe required, all in one day. When finished the templets were bundled together and sent to the works by train. I superintended the erection of those pipes, which varied from ¾ in. to 10 in. in diameter, and only one flange had to be reset. This man was a self-taught geometrician, as well as a practical and exceedingly expert coppersmith.

Value of Technical Knowledge

As to the value of technical acquirements to the shop-plater, the boilermaker and the sheet-iron worker, there can be no question. To attempt to do such work without technical knowledge is drudgery. I have employed men without such knowledge and have paid dearly for it.

One may see the burly plater who bungles through a job of a repair to the hull of a damaged ship and who succeeds with a process of "trial-and-error" and a lot of hand work in getting new plates to fit in the place of the damaged ones, but, at what a cost. I have given similar work out to young fellows skilled in the science which underlies good plating, and it mattered not whether the plates were plain or of awkward form, whether for shear, garboard or keel-strake, midship, counter or stem plates. They would take dimensions, make a few bar templets, sketch out the job, bend and drill the plates and deem it a disgrace to put one up in its place more than once for trial.

Brain Work in Boiler Repairing

Another man, a boilermaker and worthy of the name, was in charge of the replacement of the bottom half of each of a battery of Lancashire boilers. He was so sure of his methods that he visited the boilers only once to take measurements and returned to the works. He rolled and scarfed each and every plate to sketch, and drilled every hole before leaving the shop. This man had made a technical study of his trade as a boilermaker, and the result of the boiler repair was a healthy surprise to the board-of-trade inspector as well as to myself.

All of these simple facts go to prove that it is not altogether wise nor desirable to cram ourselves with a subject of what is generally known as the technical education of the schools. However, we do need to carefully and discreetly make the very best use of the time at our disposal in acquiring just as much of a particular science as is calculated to be of the greatest service in the work we have chosen.

The ultimate result of such a course would be that the majority of workmen would be thoroughly efficient

and would be able to do more work, and with less physical effort. Greater production at less cost would result and higher wages could well be paid.

Trade unions would not need to usurp managerial functions and would need only to fulfill their legitimate functions of looking after their members' best interests by co-operating with the employers for mutual benefit. This condition would lead to exclusion, as far as possible, of other than competent workmen for the highest rates of pay, and a distinct grading of others not so competent.

The foregoing are some of the beneficent results which would accure from a whole-hearted effort toward a higher status for the worker. The general effect would lead to a substantial elevation of the national character and secure the much desired benefit of a greater share of international trade.

"Service" in a Machine Tool Plant

WESTERN CORRESPONDENCE

Someone has said that this is an age of service. However true that may be, the Gardner Machine Co., Beloit, Wis., is one firm that has applied the idea in a practical way by creating a service department where any customer, or prospective customer, can see his work in process of grinding before he purchases a machine. It also gives him an opportunity to see what the finish will be, and gives him definite knowledge as to the amount of production obtainable.

The service department, shown in Fig. 1, contains one machine of each type built by the Gardner company, and upon these machines they grind, without charge or obligation, sample parts submitted by any prospective customer or present user who is having trouble in obtaining the desired quality or quantity. It is only incumbent upon the client to send enough parts so that a fair estimate can be made of the time required for the operation.

The service department is in charge of an expert demonstrator who designs whatever is necessary in the way of a fixture for holding the work, and when the report on the demonstration is made, all the necessary instructions for the manufacture of a similar fixture are included. If the client wishes, a sketch of the fixture is also submitted for his use. This has been a popular addition to the service.

TEST NO.

Service Department

Gardner Machine Company

"The Disc Grinding Authorities"

Beloit, Wis., _____ 19____

Demonstration for

Name or Symbol of Piece	No. of Pieces	Material	Approx. Area	Tolerances	Approx. Stock Removed
Clutch Collars.	25	Phosphor Bronze	10 Sq. in.	+ .001 - .001	1/8"

Condition of Samples	Requirements	Abrasive Disc Used
Good Castings	Grind two sides parallel	#163 G.I.A. for roughing. # 60 Adamite for finishing.

Machine Equipment Used #14 "plain" type with Wooden work holder.

Fixtures Used	Actual Grinding Time	Estimated Production per hour
Wooden work holder	Roughing 140 per hour. Finishing 200 per hour.	120 roughing cut. 180 Finishing cut.

Approximate Life of Disc on above work	Method of Handling
G.I.A. Discs one week Adamite Discs one day.	A simple wooden work holder was used to place work between wheels.

Remarks:

These pieces had about 1/8" excessive stock. We recommend that these patterns be cut down at least 3/16" on 1/32" on each side is plenty of stock to get finish.

We give you above an accurate and conservative report on Gardner Grinding samples of your work. This report can be duplicated in your own factory by using the equipment recommended. The services of this department are at your disposal free of charge and without obligation.

GARDNER MACHINE COMPANY

By WLT

FIG. 2—REPORT OF GRINDING DEMONSTRATION

The report, a replica of which is shown in Fig. 2, is returned to the client with his finished samples. As can be seen, both the actual production and the estimated production are given in the report, and this estimate is guaranteed. Recommendations as to the method of holding the work, the amount of stock to be allowed for finish, or anything else that would tend to help in increasing the amount of production are also included in the report.

The Gardner Machine Co. takes great pride in this large, well-equipped and efficiently - conducted department, and feels that it is in keeping with the spirit of the times. That it pays actual dividends has long since been satisfactorily proved, and the company would not under any circumstances consider abolishing it.

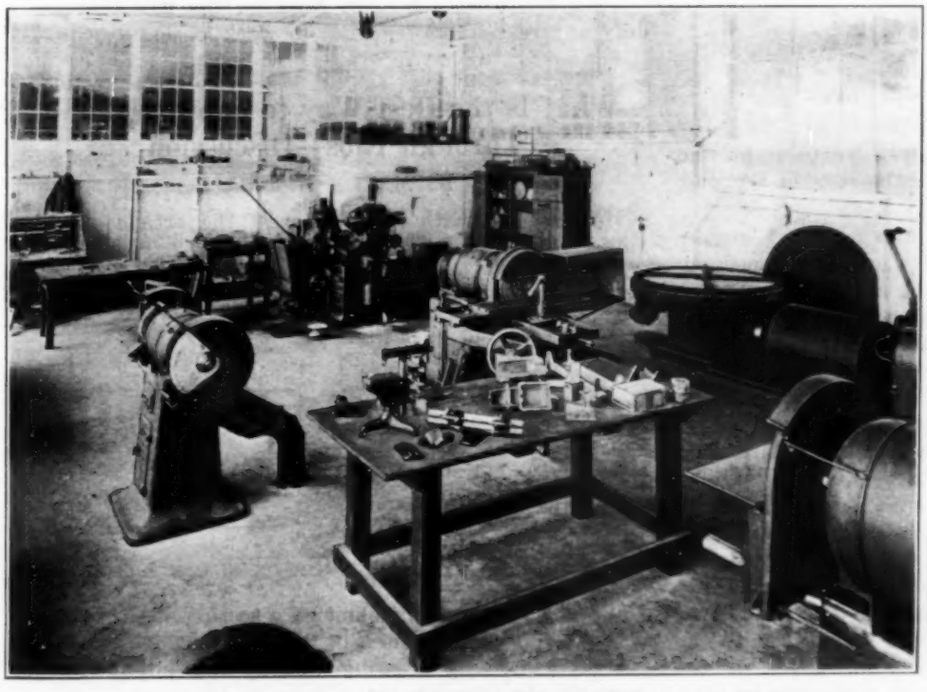


FIG. 1.—VIEW OF GARDNER SERVICE DEPARTMENT

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

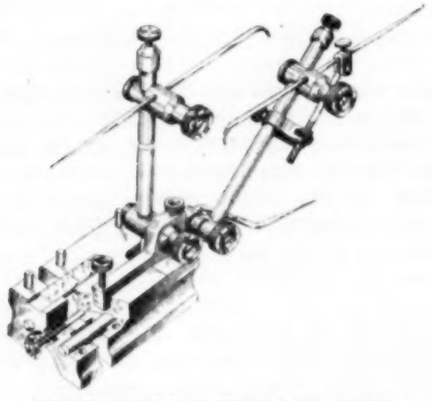
Three-in-One Surface Gage

BY B. R. WICKES

The illustration shows a surface gage designed by the writer, that has an advantage over the common form of gage by reason of the three scribers, or locating points, which may be adjusted independently or in unison as desired.

The base is made in two parts, one of which is adjustable to and from the main base by means of a screw and graduated dial. Provision is made also for clamping a standard 2-in. scale in a slot in the base so that the movement may be read directly from the graduations. Two hardened steel rods driven in the main base support the sliding member, the range or adjustment of which is ½ inch.

Six hardened push pins, four in the main base and two in the sliding member, enable the tool to be used to



MULTI-PURPOSE SURFACE GAGE

obtain a setting parallel to a given surface, as the front of a milling machine table or the slots in a planer platen.

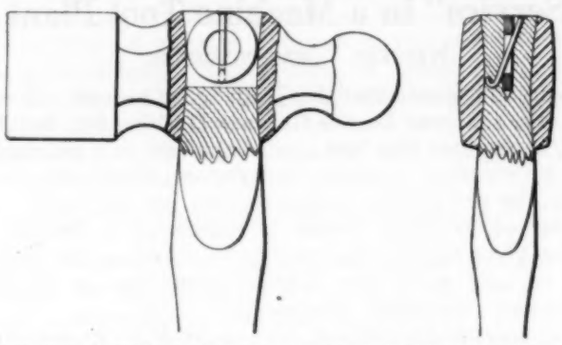
The two main spindles are mounted upon a rocker in the base that is adjustable by means of a finely pitched knurled head screw, working against the tension of a coil spring. Each scriber is so mounted upon its respective spindle as to be capable of independent adjustment. The bent scriber is to be used for scribing lines parallel and close to the base upon which the work is resting. It is adjusted by turning and is clamped in position when the adjustment is obtained by means of a knurled head setscrew.

The upper ends of the main spindles are so made that an additional scriber may be clamped in each for the purpose of locating centers or surfaces when a number of pieces of work are to be lined up for planing or milling, thus enabling the operator to do all the locating with one tool at one setting and do away with the necessity for the use of several other gages or the resetting of a single gage for each measurement.

Method of Holding the Handle in a Hammer

BY CHARLES KAUFMANN

The *American Machinist* has recently illustrated several ways to wedge a hammer handle so that the head will not come off. All these ways require the making or hunting up of something that is not usually at hand. Washers and wire nails should certainly be easy to



ANOTHER WAY TO HOLD A HANDLE IN A HAMMER

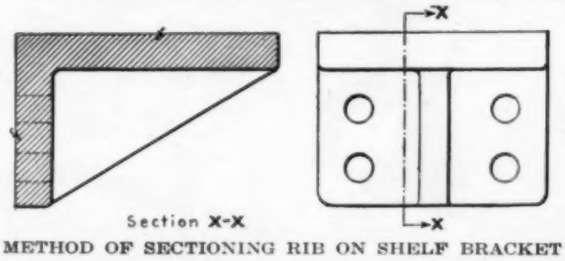
find in any shop and one of each is all that is needed to hold these two parts together under any sort of use or abuse. As shown in the sketch, drive a washer edgewise into the split end of the handle. Then take a wire nail, make a slight kink on the end so that it will not go straight, and then drive it cornerwise into the handle so that it will go through the washer and fetch up against the wall of the hole in the hammer head.

This will bend a sort of hook on the nail that will defy any reasonable tendency to work loose.

What Is the Best Way to Show Sections Through Ribs—Discussion

BY MARTIN H. BALL

Having read with much interest the article on this subject by Aloysius Wilks on page 787, Vol. 56 of *American Machinist*, it seems to the writer that it is feasible to show the shelf bracket theoretically correct



METHOD OF SECTIONING RIB ON SHELF BRACKET

and still be practical by showing a section of the bracket at one side of its center on line *XX*, as indicated on the accompanying drawing, and by this slight change keep the draftsman's work down to the minimum.

An Adjustable Open-End Wrench

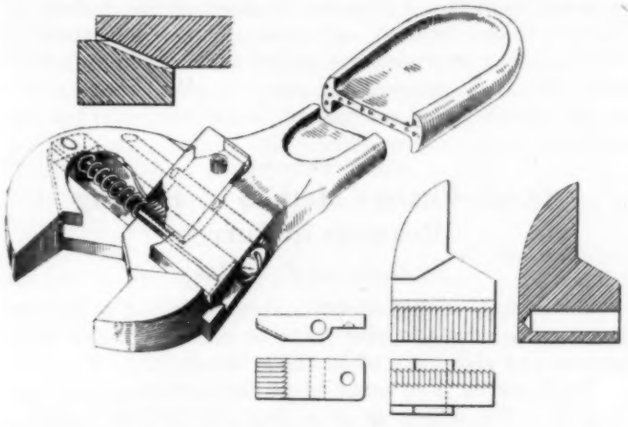
By R. W. Beckman

The quick-acting, adjustable, open-end whench shown in the accompanying illustration was designed by the writer primarily for use around the milling machine, but it soon demonstrated its adaptability and handiness to such an extent that it is now in general use throughout the shop.

In general shape and appearance it is not unlike many adjustable wrenches now on the market. Its advantage lies in the absence of screws or other adjusting mechanism that will inevitably work out of adjustment and cause endless annoyance.

The sliding jaw is made a nice, easy fit for the square hole that extends through the fixed jaw. As may be seen in the detail sketch, the bar of the sliding jaw is beveled to an angle and cut with suitable ratchet teeth. A "trigger," or latch, set into an opening made in the solid part of the tool, engages these teeth and holds the sliding jaw in whatever position it may be set.

A coil spring under the free end of the trigger holds the ratchet teeth in engagement. To use the wrench the operator's thumb is pressed upon the end of the trigger, releasing the sliding jaw which is then opened



ADJUSTABLE OPEN-END WRENCH

to its full extent. Setting the wrench upon the nut to be turned, with the fixed jaw against one of the flats, the sliding jaw is pressed forward into contact with the opposite flat where it will be held by the ratchet teeth.

Within its capacity the wrench is a very handy tool; almost instantaneous in adjusting and gripping any nut, bolt head, or rod that has two opposite parallel flats. Like all other tools, it can be abused, and should be handled with intelligent consideration of its limitations.

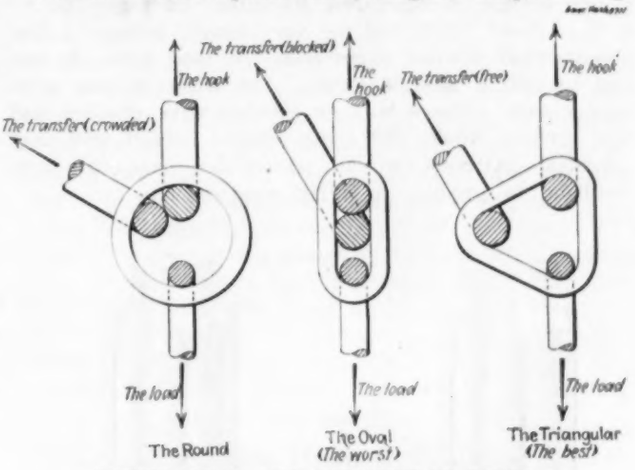
The Advantage of Triangular Rings for Sling Chains

By J. T. Towlson
London, England

In any erecting or other shop where heavy loads are handled by means of cranes or chain blocks, it is often necessary to transfer a load from one crane or block to another without lowering it.

When the sling chain, of the double hook type, for example, has a coupling ring of oval shape, it is a difficult matter to make the transfer safely because of the fact that one hook crowds or binds the other so that neither can be released easily. The round ring is some better in this respect, but is not so good as it should be.

For this reason I prefer the triangular shape of ring.



ROUND, OVAL AND TRIANGULAR RINGS FOR SLING CHAINS

With such a ring there can be no crowding of hooks, and there is always an inviting corner of the triangle in which to hang the second hook.

costs of service of a utility operating its own generating

Tap Drill Size Chart for Toolcrib

By R. L. Anderson

A device for displaying the size, pitch and diameter of drill for any standard size of tap, that eliminates the possibility of error on the part of unskilled men who may use it, is shown in the accompanying illustration.

The chart should first be prepared by typewriting the several notations in their respective places on a sheet of heavy paper and gluing the paper to the cir-

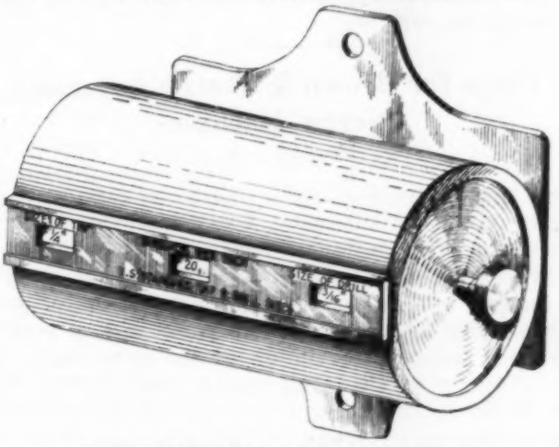


CHART FOR TAP AND DRILL SIZES

cumference of a wooden roller of suitable size. The rest of the device may be made of tin or galvanized iron. A strip of glass let into the top of the casing adds to the permanence of the figures.

The device can be fastened near the window of the toolroom so that when taps or drills are required the workman has but to turn the knob until the desired nominal size of tap appears in the opening, when the rest of the figures may be seen in their proper places.

A Troublesome Milling Job—Discussion

BY P. MARSTEN

The article in *American Machinist* on page 352 by J. C. Adams interested me very much, because I had a somewhat similar experience not long ago. I, too, had to mill a narrow ledge. The material was steel in my case. There was no trouble with chatter, but the surface would not come square, which was very essential. At least two, and sometimes three, cuts were required to produce a fairly good result.

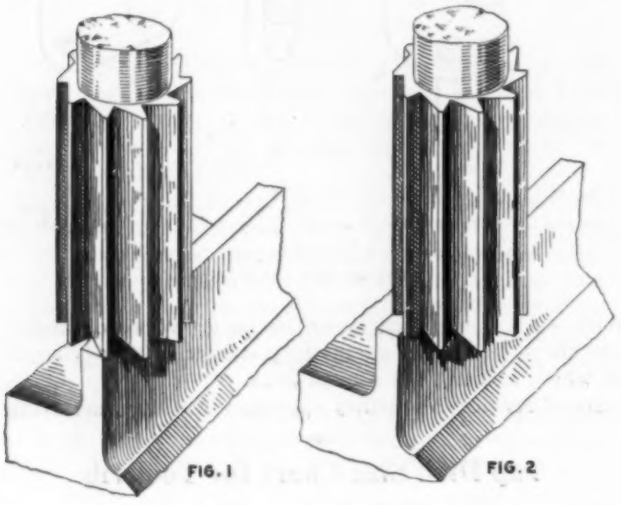


FIG. 1—CUTTER POSITION THAT PRODUCED CHATTER

FIG. 1—CUTTER POSITION CHATTER ELIMINATED

The job was done on a vertical milling machine and a 1¼-in. end mill was used as in Fig. 1. It took me quite some time before I tumbled to the fact that the pressure was at right angles to the work and bent the thin web; but once I realized this, it did not take me long to change the cutter to the position shown in Fig. 2. My trouble disappeared at once and I got a square job with one cut.

Cams for Brown & Sharpe Automatic Screw Machines

BY STEPHEN MCEVOY

In the design of cams, such as are used on Brown & Sharpe automatic screw machines, it is the practice of some designers to lay them out on what is known as a two to one layout. That is, for one cycle of the cam two sets of lobes are laid out and, with two sets of tools in the turret, two parts will be produced for each complete revolution of the cam shaft. The idea of this is that it is supposed to produce more work, but in reality it causes a decrease in the production, there being no provision for bringing the turret slide to a positive stop. Therefore, the accuracy of the lengths turned, drilled, etc., must depend on the accuracy of the lobes on the cam.

Where the work is not of accurate dimension, the above method is passable. But where the tolerance is small the method is far from being ideal. Even as to productive speed, it will be found that, by figuring for a single layout, any piece which takes more than three seconds can be done as fast theoretically and faster practically by the simple use of the correct gears necessary for the number of seconds to complete the part. The fastest gear furnished with the machine is three seconds and, if a piece can be made in less than that time, the two to one method is all right. The only parts, however, which can generally be made in that time are small pins.

My methods for laying out cams for Brown & Sharpe automatic screw machines is to adhere strictly to the single layout, requiring a simple set of cams for the toolmaker to make. This cuts down tool labor expense and makes a simple job for the operator to set up and keep going.

Another phase to be considered is wear on the machine and on jobs which call for three or less turret tools, I place an extra set of tools in the turret. I also remove three of the trip dogs for revolving the turret, consequently making one complete revolution of the turret to produce two parts. This method is, of course, only of advantage on fairly long run jobs but I am not claiming that I produce more parts per unit of time. I do save the wear on the machine by eliminating idle movements. When the work is such that only two tools are used, another dog can be taken off, leaving only two on the carrier and placing three sets of tools in the turret. This is done only on scale dimension work.

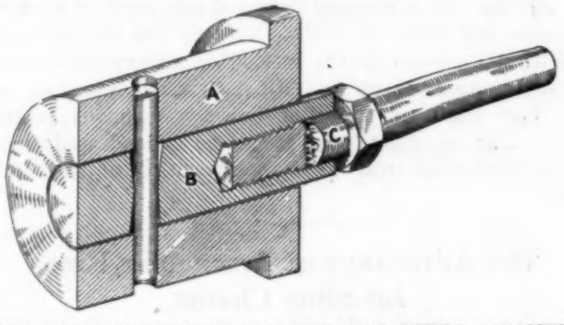
It is extremely hard to convince anyone who has not operated a Brown & Sharpe machine of the fallacy of the two to one layouts, especially if he be an executive responsible for production. Unbiased reasoning, however, will soon convince the most skeptical that he will learn something of advantage if he will only try my method.

Quick-Change Method of Holding Reamers in Turret

BY CHARLES A. T. KERR

The accompanying sketch shows a method of holding shell reamers in a turret lathe or screw machine when changes of size have to be made frequently.

The bushing *A* is made to fit the turret hole or toolholder. The block *B* is a float fit in the bushing, floating on the convex surface of the crosspin hole, which is tapered from both sides to the center, thus allowing movement in all directions to part *B*. Parts *A* and *B* remain always in the machine.



QUICK-CHANGE FLOAT HOLDER FOR SHELL REAMERS

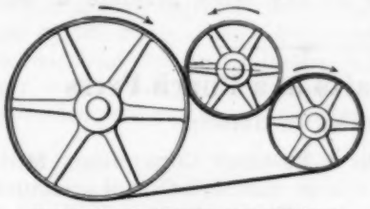
Part *C* is a hardened and ground reamer shank threaded to fit into *B* and secured by the lock nuts. For various sizes of shell reamers the only difference in the outfit is the size of the tapered shank.

By making part *B* with a smooth hole instead of a threaded one, other tools than shell reamers may be used by simply making the shanks interchangeable and cross-pinning them into part *B*.

Keeping a Belt Tight

BY ROBERT GRIMSHAW

Under the above title on page 785, Vol. 56, of *American Machinist*, Mr. Towlson uses the word "intermediary" in reference to an unusual type of auxiliary belt pulley. It is a friction pulley between driver and driven, designed to neutralize the great pressure on bearings, due to excessive belt tightness in turn necessitated by two unfavorable conditions: Great difference in pulley diameters, and short distance between centers, the two resulting in insufficient arc of contact and surface of contact on the smaller pulley. This is a condition practically inseparable from circular-saw drive, where the necessity for utilizing practically the entire saw disk radius down to the clamping flanges, makes the use of an auxiliary of some sort an absolute requirement.



PROPOSED TYPE OF DRIVE

The tightener pulley is an abomination, straining the belt (or the lacings) and wearing journals and bearings, also consuming power in excess of that gained in transmitting force by its use. In other words, it is both dynamically and mechanically inefficient.

Dynamo and motor makers, where the belt-driven machine is practically on the same base as its driving or driven mate, replace the tightener by something more convenient but also more inefficient—a slide and adjusting screws to keep the belt good and taut, or at any rate, taut.

The idler pulley is an improvement over the tightener, as an intermediary, increasing as it does both the arc and surface of contact on the small pulley—if put in the proper place, which it seldom is—without greatly increasing the belt or lacing strain, or the pressure on journals and bearings.

Mr. Raworth's intermediary acts in a two-fold manner, to counteract excessive journal and bearing pressure and to act as a friction driving pulley.

Now why not combine the two systems, the idler that puts no strain on the bearings, which the tightener does, and the friction pulley between the driver and driven members? As the belt stretches, which will be less than if it is under high stress (the proper name of which is strain), it can be taken up, or an idler proper can be put on the other fold (below in the sketch) so that the "intermediary's" center is moved only to take up wear of journals and bearings of the members proper of the drive couple.

Two Kinks for the Toolmaker

BY F. B. SHOEMAKER

Dry asbestos wicking, the kind sometimes used by plumbers and steam fitters for packing valve stems and similar joints, is much better material for packing small holes in intricate dies and pieces to be hardened than is fire clay. Containing no moisture, it will not "blow out" in quenching and it is more easily removed from the holes after it has served its purpose.

Plunging longitudinally in the quenching bath and moving around while cooling, has a tendency to prevent the warping of long slender pieces.

Two Ways of Making a Core

BY P. W. BLAKE

Referring to an article by M. E. Duggan under the above heading which appeared on page 233, Vol. 57, of *American Machinist*, the core shown in the illustration is a stop-cock body core and not a core for a brass valve body as stated. Mr. Duggan doubts if there are many pattern makers sufficiently well informed on core-making practice to give a positive answer to the question: "Is this method practicable and economical?"

Any patternmaker trained in the manufacture of plumbers' brass goods knows that the practical method is to use core dryers on the smaller sizes because the dryers keep the cores from warping. As these cores are to be produced in large quantities, the proper method is to use gang cores boxes in which the cores are both made and dried.

Drilling Trunnion Holes in Wooden Rollers

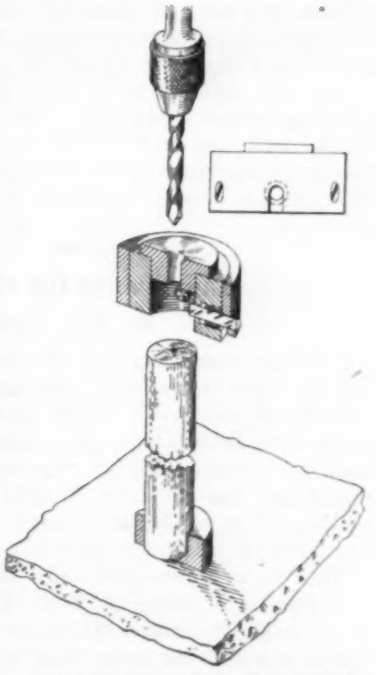
BY CHARLES G. SPICER

Having occasion to drill holes in the ends of a large number of wooden rollers for the purpose of driving in steel pins to act as trunnions, and as the rollers were required to run fairly true without being turned, I devised the jig here shown to drill them. The rollers were about a foot long and ⅞ in. in diameter, with a ¼-in. hole in each end. With this jig I was able to drill, on both ends, from 400 to 450 rollers per hour.

I took an iron ring, or bushing, of a considerable thickness of wall, and drilled therein three radial holes, using two sizes of drill in order to leave a shoulder in each hole near the inner wall of the bushing. To these holes I fitted shouldered plungers and coil springs as shown in the sketch.

A drill bushing of hardened steel in the central hole of the main bushing completed the device. The hole in the main bushing fitted closely but not tightly over the rollers and the tension of the springs held it in place.

The drill was held in the chuck of a small drill press and a cup center on the table of the drill press served to locate and center the lower ends of the rollers.



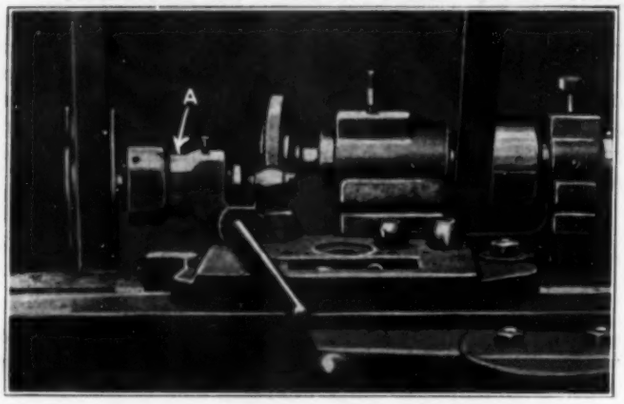
JIG FOR DRILLING END HOLES IN ROLLERS

Over the outside of the bushing, after the plungers and their springs were assembled, I drove a thinner steel shell having three holes to correspond to the small ends of the plungers. This shell thus acted as a backstop or retaining ring to keep the springs in their cells. The outer shell was fastened in place on the main bushing by means of screws.

Grinding Universal Joint Balls

By Henry M. Clary

Having an order to make up a lot of universal joint balls, to be made of steel, hardened and ground to 1¼ in. in diameter, we were ultimately confronted with the problem of grinding the radius on the balls. Using an old die-plate for the base of the fixture, a block was cut to the shape shown at *A* in the illustration, then drilled and tapped in the bottom to receive a ½-in.



A SIMPLE RADIUS-GRINDING FIXTURE

pin which slipped into a hole in the die-plate, this pin acting as a swivel.

Then the block was bored for the spindle, which held the work on one end and the pulley on the other as shown. An adjusting collar in the end of the block next to the pulley allowed adjustment of the spindle for radius, the correct diameter being obtained by movement of the table. The ball was held on the end of the spindle by a nut. A short bar, threaded on the end and screwed into a tapped hole in the side of the block, served as a handle to swing the block.

The ball revolved at a speed of 344 r.p.m., and the grinding wheel speed was 1,800 r.p.m. The diameter of the ball was held within 0.002-in. limits, and an average production of 20 pieces per hour was obtained. This job was done at the Royal Machine Works, Detroit, Michigan.

Lubricants for the Shop

By H. R. Smith

Although much has been written about cutting lubricants, I have not noticed any mention of the lard-and-turpentine mixture. I have used this mixture many years with satisfaction, particularly for pipe threading. Lard oil seems so highly esteemed that the small user sometimes has difficulty in obtaining it pure or even getting it at all. But anyone can get common lard and common turpentine and mix them.

This is recommended only for squirt-can use and if it freezes or clogs the heat of a match will thaw it. If set aside in corked bottles in a warm place, and allowed to stand for some time, a clear fluid rises which is less affected by cold than the cloudy precipitate. The latter often needs to be warmed to make it flow.

Some years ago I read in the *American Machinist* of the use of beeswax as a lathe-center lubricant. Having faith in a number of other lubricants, such as flake graphite, oildag paste and mobiloil B, I tried to make up a shotgun prescription as a "cure all." I mixed these four ingredients in about equal amounts (melted the beeswax and added the others) making a black grease which is very effective for I have never had a center damaged while using it.

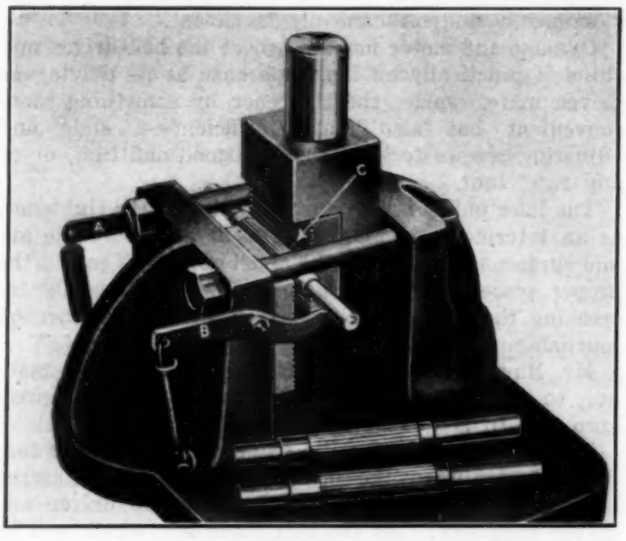
For the most severe work, if an oil be preferred, where effectiveness is more important than cost (as for instance to feed through a hollow lathe-center), I would suggest oildag paste with enough mobiloil B to make it liquid. The graphite in oildag is fine enough to pass through a filter, so there is no danger of it clogging any passages. Oildag paste is the concentrated form intended to be mixed with a large amount of oil, but of course is as harmless as any other graphite in any proportion.

Knurling Shafts in a Punch Press

By Frank C. Hudson

The American Radio & Research Corporation, Medford Hills, Mass., uses a large number of small armature shafts in special motors. These shafts are knurled in the central portion as shown in the illustration. Instead of knurling them in a lathe, as is usual, the device shown was made to handle the work in a punch press.

The die is tied together by two substantial bolts to prevent spreading when the punch rolls the shaft down.



PUNCH AND DIE FOR KNURLING SHAFTS

The shaft to be rolled is laid on the inner ends of the arms *A* and *B*, which tip down and release the shaft as it is rolled downward. The punch carries the corrugated steel block at *C* and there is a corresponding block in the die. A single cycle of the punch rolls the corrugations in the shaft, so that the production is very rapid.

How to Obtain Order

By Robert Grimshaw

The main things in obtaining order are:

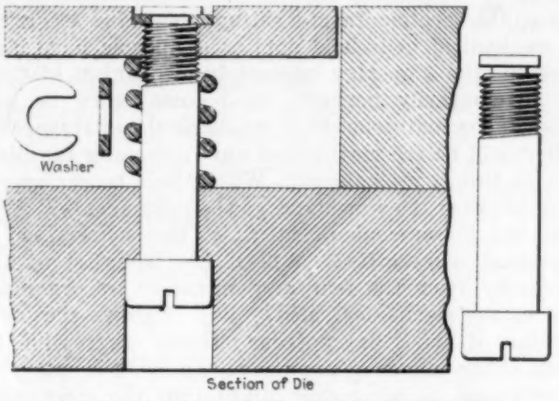
(1) An orderly mind
(2) The ability to impress on others the necessity for order
(3) A working force
  (a) capable of receiving that impression;
  (b) willing to co-operate in the necessary regulations to keep order.

Special Screw and Washer for Spring Strippers

BY EDWARD H. TINGLEY

The accompanying sketch shows the style of screw and U-washer that is being used on all dies that have spring strippers in the plant of the Delco-Light Co., Dayton, Ohio. The trouble which was ever present with the usual type of shoulder screws for stripper plates caused this company to study the problem and design this special screw and washer.

The size of the screw and washer vary according to the size and strength of the stripper springs. The thickness of the washer has been standardized at $\frac{1}{16}$ in. and the width of the recess in the end of the screw is not over $\frac{1}{64}$ in. wider. The stripper plate is counterbored $\frac{1}{32}$ in. larger than the outside diameter of the washer.



HOLDING SCREWS IN SPRING STRIPPER

In assembling, the screws are screwed into the stripper plate until the recess shows above the face of the stripper, when the washer is slipped into place and the screws are backed off until the washer is clamped against the bottom of the counterbore.

It has been found in practice that this style of screw will not loosen, where the shoulder type will loosen and cause trouble. This style of screw and washer has been in constant use in many dies for four years with very satisfactory results.

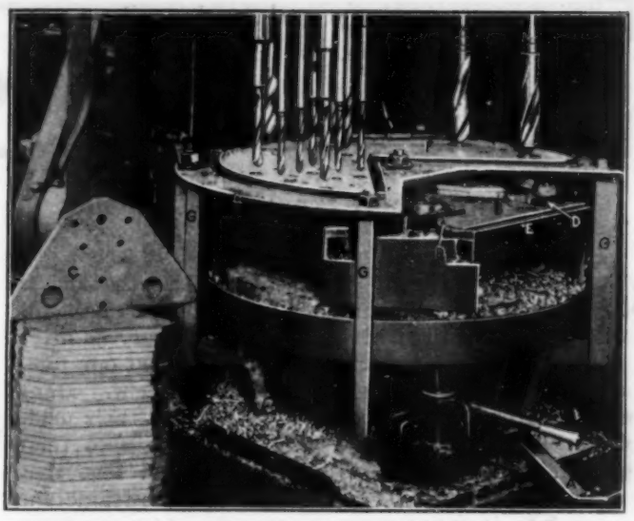
Using a Multiple-Spindle Drilling Machine as a Station Machine

BY FRANK C. HUDSON

An extremely interesting and unusual use of the multiple-spindle drilling machine on structural steel work is shown herewith, the illustration being from the shop of the Brown Hoisting Machinery Co., Cleveland, Ohio. The machine is fitted with a revolving and indexing table, which is controlled by the treadle *A*, in front of the loading station, where a piece of work is shown in place at *B*.

The work in this case is a sort of three-cornered brace, shown completed at *C*, the finished piece resting on a pile of blanks which have been sheared to the proper shape. The work is clamped by the two side straps shown at *D*, against the front angle iron *E* which squares it in position.

The drilling spindles are divided into three groups, the first operation being at the left. A large drilling plate or fixture *F* fitted with suitable bushings, is supported above the work by the arms shown at *G*.



USING A MULTIPLE-SPINDLE DRILLING MACHINE AS A STATION MACHINE

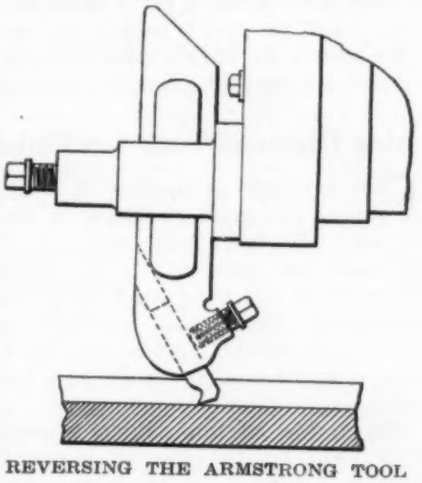
The first group of drills at the left drill eight holes, omitting only the center hole in the upper corner. It does not however, drill the two large holes to size, but makes a beginning with the two large drills at the outer edge. The next station drills the hole in the upper corner and enlarges the holes at each end. The last position finishes the large holes. This arrangement of drills divides up the work and gives a completed plate at each indexing of the table.

A large variety of guide plates or drilling fixtures enables many different pieces to be done on this machine. The plan opens up possibilities in many other lines and increases what has usually been considered as the field for the multiple-spindle drilling machine.

The Armstrong Holder as a Spring Tool

BY WILLIAM J. THIRKETTLE

The writer had occasion to cut a slot $\frac{1}{2}$ in. wide and $\frac{3}{8}$ in. deep by 8 in. long in a piece of steel, and had trouble in securing the smooth finish that was required at the bottom of the slot. The work was done with an Armstrong toolholder, used in a shaper. As the cut approached the bottom of the slot, accompanied by the usual chatter, I conceived the idea of reversing the holder and grinding the tool bit as shown in the sketch. This made a very excellent spring tool, as, owing to the angle at which the cutting edge was presented to the work, it was impossible for it to dig in, and a very satisfactory finish resulted. This method might be followed in similar cases, as it provides an effective remedy for a trouble frequently met.



REVERSING THE ARMSTRONG TOOL

Editorial

The Place Where Small Tools Should Not Be Made

OLD habits die hard. We may think that the time is past when every man made his own shoes, built his own house and raised his own food, but every so often the old habits crop out and we try to be what our forefathers were, 10,000 years ago; self-sufficient. Many manufacturers have failed because they had their pride of wanting to make everything that went into their product. They wanted to show the world that they were self contained. Cases of this kind are tragic and fortunately, they are not met every day. On the other hand there are innumerable cases of this self-sufficiency which are merely laughable. And yet, in the aggregate, they are of enough importance to be pointed out as a warning.

A common symptom of this disease is the making of small tools, either in the tool room or, quite often, in the manufacturing department of a shop. Perhaps with the exception of twist drills, every small tool in the shop is pounced upon by the amateur and appears as a home made product whenever there is any excuse for it at all.

As a rule, such home made tools cost more than those purchased. However, that is not the worst of it. We might let the man have the pleasure of fondling his own baby, even if it costs a few pennies, but it is at least a ten-to-one shot that the homemade product is made of a piece of steel that was handy even if it was not entirely suitable. It was probably not made correct as to angles and not properly hardened. However, the man who made it is not going to let his pet suffer and so he favors the tool and slights production. There are so many phases to this thing, and all of them bad ones, that it would take an old-fashioned sermon in three main parts to cover them all.

We think we save a penny, but we don't.

We believe we have a good tool, but we haven't.

And we forget all about the main thing: production.

Using Diamond Tools for Finishing Bearings

THE accurate production of holes for bearings is one of the great problems in the building of machinery. It has been very carefully studied by engineers and shop men in the automotive industries and much of the hand work of former years has been eliminated. The latest development seems to be in the use of diamond cutting tools for the final finishing, and some very interesting results have been secured in this way.

The article on this subject elsewhere in this issue gives data on the use of diamond tools which is startling in many ways. Continued accuracy which eliminates scraping and the use of a single tool in thousands of holes without resharpening, are points to be carefully considered by builders of any kind of machinery. Shop managers who are interested in quantity production of high-grade work should study this article carefully.

The Spread of Mechanical Skill

A NEW YORK newspaper quotes a Western merchant to the effect that the railroad shop strike was broken in the Central West by the sons of farmers. We are not concerned with the accuracy of the statement, but we see in it an indication of a national tendency that may well be noted by the machinery industry.

We often remark casually that we live in a mechanical age, although we usually fail to connect the remark with the thought that we are becoming a race of mechanics. With the advent of the automobile, the tractor, the electric farm-lighting plant and electrical and mechanical household appliances, people have been forced to take a greater interest in mechanical matters and, involuntarily perhaps, to become more or less skilled in the maintenance of mechanical contrivances.

What will be the meaning of our increasing familiarity with things mechanical? Will it be a larger appreciation of good machines and good workmanship? Will it be an increasing difficulty in the marketing of mechanical makeshifts? Will it be the relief of the community from the fear of domination by organized labor in the mechanical field? Will it prove the safeguarding of the country from military aggression by reason of the universal knowledge that, as a country, we are prepared to jump over night into the mechanical production of munitions necessary for modern warfare?

We are not prepared to answer all these questions, but aren't they worth thinking about?

"Tempering the Wind—"

A GERMAN student has managed to remain over three hours in the air in a motorless sailplane or glider. Perhaps, after all, the treaty provisions which forbade the construction of high-powered airplanes in Germany and which caused such a piteous outcry from the vanquished will react to their benefit.

Little is known, even yet, of the laws governing mechanical flight, but we seem to have progressed since the days of the war when the principal effort was to develop engines of higher and higher power. Designers knew then that the more power they could crowd into a plane the faster it would fly, and they had no time to devote to scientific research or to plane refinements. As a result we had single-seaters propelled by motors of 300 hp. and upwards, economic monstrosities.

Apparently we are about to go forward from the point where the Wright brothers left off. They were principally concerned with discovering means of control, and they were successful. The present-day gliding tests begin with a very fair knowledge of the control factor and aim at further advances in the knowledge of the laws of sustained flight. Germany is off to a good start.

It is not too much to say that we are on the threshold of a revolution in the science of flying. Perhaps before many months the dust column behind the flying automobile on country roads will be peopled by small boys in home-made gliders, even as their fathers "hitched on" behind the grocer's sleigh.

Where Arithmetic Is Needed

THE coal strike is at an end and it is time for some afterthought.

The anthracite miners originally refused to accept a reduction in wages of, practically speaking, 20 per cent. To show how much they were in earnest they struck on the first of April and did not resume work until the eleventh of September, a loss of 163 days or 23 weeks in which they might have earned money. At the end of this period they agreed to go back to work at the old wage, that is, without any reduction, and this agreement is to last until September first, 1923. Under the new agreement they will work 50 weeks. If they had stayed at work, with reduced wages, they would have worked 73 weeks between April 1, 1922, and September 1, 1923.

As far as their total earnings are concerned, we may say that they would have worked 73 weeks at 80 units of pay, whereas now they will work 50 weeks at 100 units of pay. In other words, their total earnings by the first of September, 1923, might have been 5,840, whereas it will be 5,000. In other words, they lost 14 per cent of their income even though they won the strike.

They had asked originally for an increase of 10 per cent and even if they had obtained all they demanded, their income would have been the income of 50 weeks at the rate of 110 or a total of 5,500. Had they obtained this increase, they would have lost 340 or approximately 6 per cent.

Let us put this in terms of dollars and cents: Suppose a man used to get $25 a week, then he asked for 10 per cent more, or $27.50 and was offered 20 per cent less or $20.

If he had accepted the offer he would have earned 73 times $20 or $1,460.

If, at the end of the strike he had obtained what he demanded he would have earned 50 times $27.50 or $1,375.

And as it stands now, he will earn 50 times $25, the sum of $1,250.

We used to consider that there were only two parties to an industrial controversy, employer and employee. Lately we have begun to realize that there is a third party, the public. It would seem that a fourth party should also be recognized—Arithmetic.

Cause or Effect

THE question of which was first, the hen or the egg, has never been satisfactorily settled, but nobody, in his right mind, denies that there is some relation between the two. We meet every so often a hen and an egg in disguise. Take, for instance, the fact that the automobile industry in this country has developed in an extraordinary manner and the parallel fact that, as a whole, automobile factories are wonderfully well equipped with machinery and tools. Aren't these two facts a hen and egg in modified form?

Of course, at the present the automobile industry is on such a large scale and on such solid footing that the factories can well afford to use the best there is in equipment. What is more, without the most up-to-date machinery, tools and methods, present day production and prices would be impossible. However, there was a time when the automobile had most of us guessing as to whether it had come to stay or come to go, when there was neither solid footing nor large production. And so we have once more the riddle of the hen and the egg before us.

Does the automobile industry have up-to-date equipment because it has such large proportions or, has it assumed these proprtions because the pioneers in the industry had the vision and the daring to spend their money for equipment which would insure large and cheap production. Whatever the answer may be, we cannot shut our eyes to the fact that here, as in so many other cases, wonderful growth and development have gone with modern equipment and methods.

Saving at the Spigot

ONE of the favored pastimes of some shop managers is to send circular letters from time to time to the department heads telling them that overhead must be reduced, *must* underscored. Thereupon, the obliging department head slashes the overhead and everybody is happy for the time being. One of the preferred ways of reducing the overhead charges is by cutting tool costs. Instead of buying expensive cutters and hobs, collapsing taps and what not, he makes them in his own department.

Most fair sized and all large shops have their tool room in which such work is supposed to be done, if it must be done at all. But our wise department head does not send his job to the tool room—not if he must cut overhead. The toolroom would probably charge him 50 per cent more than the price of a commercial product.

And so he has this work done by men who are mere amateurs at it and gets an inferior tool for a superior price. In addition, his production is bound to suffer and he must hide the cost of work done on the tool, something which is easy enough for a man who knows the ropes. But after all, the main object has been reached. Overhead has been reduced and the G. M. is happy.

There are other managers, lots of them, who know the ropes themselves and who do not insist on cutting overhead. They do try, however, to get reduced costs by reducing them where reduction is possible without raising the expense more at some other point.

Just Suppose

JUST suppose you had your money invested in a concern which did not pay enough in dividends to keep your family living in comfort, and suppose you spoke about it to the general manager and the directors and other high muck-a-mucks. Suppose they told you that they did all they could for their stockholders but that times were bad, that it was necessary to lay by a reserve fund, and that anyhow, you were getting as good dividends as anybody else in that business.

And now suppose that the directors vote $200,000 for a club house for the stockholders, to be entirely free, to have a swimming pool, a tennis court and a ladies' smoking room and all other high grade club house improvements. What would you say, and how would you say it? Would you add: "and bless the directors and the general manager," to your nightly prayers? Would you get enthusiastic about welfare work for the stockholders?

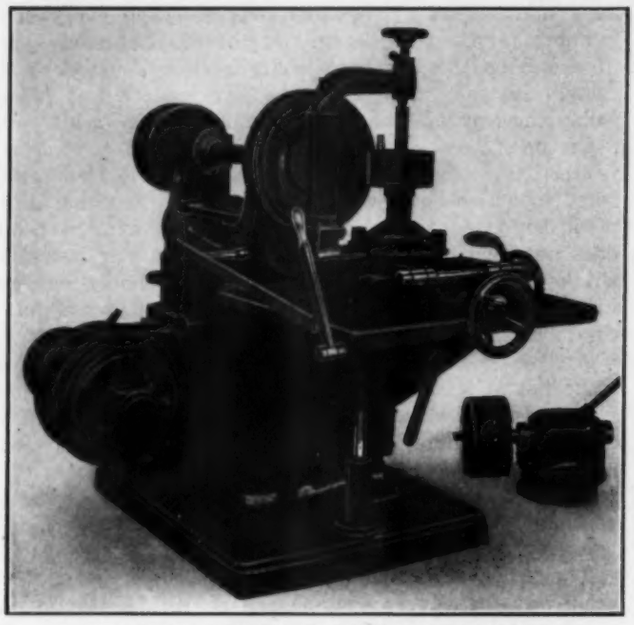
But why ask. Nobody would be fool enough to do anything of the kind. Nevertheless—

Just suppose.

Shop Equipment News

Diamond Pulley Grinding Machine

A machine for grinding the faces and edges of pulleys and similar parts has recently been placed on the market by the Diamond Machine Co., 9 Codding St., Providence, R. I. The machine is an evolution of the pulley grinding attachment furnished by this company for its regular heavy-duty face grinding machine, which attachment was described on page 435, Vol. 54 of *American Machinist*.



DIAMOND PULLEY GRINDING MACHINE

The machine carries a 14-in. diameter cylinder wheel, which is held in a steel chuck that insures against wheel breakage. The wheel spindle runs on ball bearings and is driven at a speed of approximately 1 500 r.p.m., this speed being varied to suit the nature of the work. A 10-hp. motor is attached to the machine frame.

The work carrier takes pulleys from 2 to 18 in. in diameter up to 6 in. face, the pulleys being held on a pintle positively driven through speed change gears. The work table has screw-operated movement in three planes, and an auxiliary rapid movement to and from the wheel actuated by a hand lever.

With this machine, pulleys may be ground with crown, flat, or even concaved faces, as desired, by positioning the work accordingly with relation to the wheel. The face in either case is a true ellipsoid curve instead of the usual two conical surfaces meeting at the middle The work is completed in one operation, leaving a semi-polished surface.

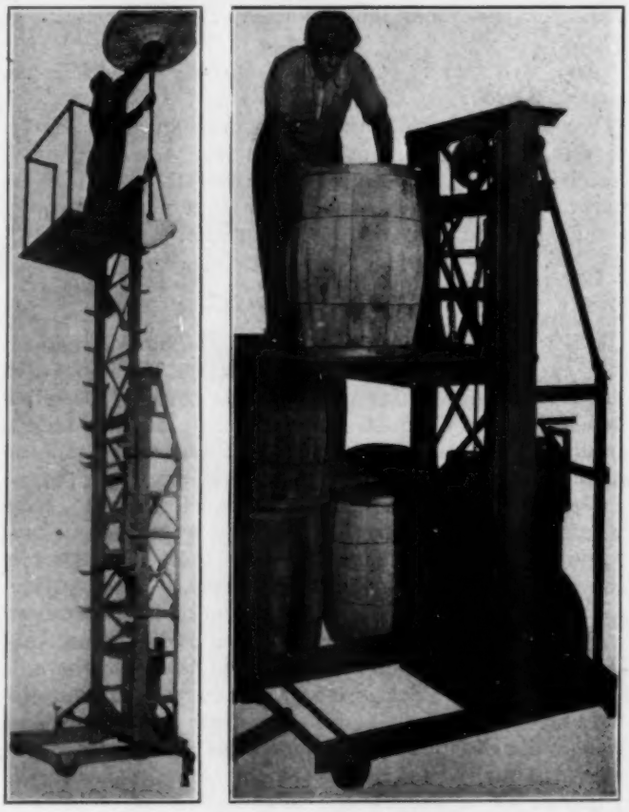
The machine is complete with pump, automatic valve, hose and water guards. By the use of water in grinding, greater production can be obtained at all times, we are told.

The attachment shown at the side of the machine in the accompanying illustration is provided for facing the edges of pulleys. The attachment may be very quickly mounted or even displaced. Its weight is announced at 50 pounds.

The machine occupies a floor space of 3 ft. 6 in. by 4 ft. 6 in., and the center of the wheel spindle is 44 in. from the floor. The weight of the machine is approximately 2,000 lb. Guards are furnished to enclose the wheel and work while in operation. The illustration shows the machine with these guards, as well as the wire belt guard, removed.

"Economy" Telescoping Tiering Machine

A portable tiering machine in which one frame member telescopes into another so that the machine has a lift nearly twice as high as its minimum height, is a recent product of the Economy Engineering Co., 2635 West Van Buren St., Chicago, Ill. The machine is made in both hand power and electric driven styles, the heavy-duty types of the latter style being operated from a power circuit, and the "Little Lifter" types, such as described on page 488, Vol. 55 of *American Machinist*, from a lighting circuit. The view on the left side of the accompanying illustration shows a tall tiering machine with the inner frame extended, while at the right is a smaller machine with the platform only partially elevated for tiering materials.



"ECONOMY" TELESCOPING TIERING MACHINE

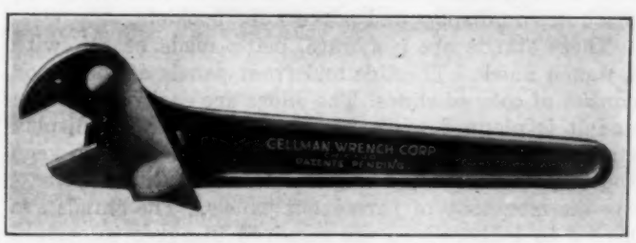
The machine is ordinarily mounted on three rollers, so that it can be easily moved about on the shop floor. When the machine has been positioned in the place desired for lifting, the steering roller is raised so that the legs rest on the floor and prevent the machine from moving. Outriggers that support the machine at the sides are provided for tall machines.

With the former models of tiering machine, the platform could not be raised any higher than the height to which the machine was built. The telescoping machine contains a set of uprights within the main uprights, this inner frame being capable of extension above the outer frame. When power is applied, either by hand or power, the platform rises to the extent of its travel with the inner frame lowered and the machine still at its minimum height, as with the usual ordinary tiering machine. The action, however, does not stop here, as both the platform and the inner frame continue to rise until the inner frame has gone to its upper limit of travel.

In descending, the inner frame comes down first to the bottom of the machine. The platform is automatically held in position at whatever point it is stopped. Devices are provided on the motor-driven machine for automatically stopping the machine at the top and bottom limits of the travel.

Gellman "Instant-Positive" Adjustable End Wrench

An end wrench that can be adjusted instantly and that stays adjusted until the nut is loosened or tightened has recently been placed on the market by the Gellman Wrench Corporation, Chamber of Commerce Bldg., 131 W. Washington St., Chicago, Ill. The wrench is drop forged and subjected to a carbonizing hardening process. The tool is very strong and rigidly constructed, and yet light in weight and thin enough to work in cramped places.



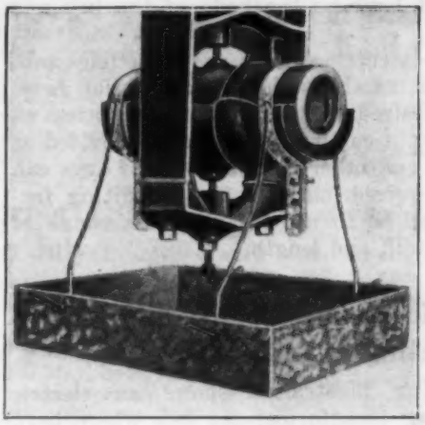
GELLMAN ADJUSTABLE END WRENCH

No screw is employed in the wrench, which construction eliminates bulkiness in the head. Referring to the accompanying illustration, it will be seen that the handle member forms the lower jaw and is notched at right angles to the gripping face, while the movable upper jaw is also notched and can be moved up or down when the notches are pulled out of engagement. Simply by pressing with the thumb of the hand holding the wrench, on the corrugated part of the movable jaw and thus disengaging the jaws, the upper jaw can be instantly moved up or down to the position desired. The wrench can be used to turn in either direction.

The tool is manufactured in sizes of 6, 9 and 12 in., weighing 4, 10 and 20 ounces, respectively. The 6-in. wrench is suited for light work, while the 9- and 12-in. wrenches are built for heavy duty, but at the same time are able to fit small nuts as well as large ones.

Acme Oil Drip Pan for Overhead Bearings

The Akron Sheet Metal Co., 103 North Main St., Akron, Ohio, has recently placed on the market a drip pan and hanger for catching oil that drops from bearing boxes. The device is especially intended for use on overhead lineshafts, as shown in the accompanying illustration, but it can be adapted to bearings secured to wall or post brackets. The pans and hangers are made in three sizes, each size being suitable for a range of shaft sizes. Shafts from 1⅛ to 2⅛ in. in diameter can be fitted. All of the pans are 2 in. deep and the sizes are 6x8 in., 8x10 in. and 10x12 in. The hangers can be quickly installed on any style of bearing box. The pan may be easily removed for cleaning without disturbing the hangers. Since the pan is quite effective for catching oil that drips from bearing boxes, it prevents the soaking of floors and the damaging of goods that occurs when oil drops from the shafting.



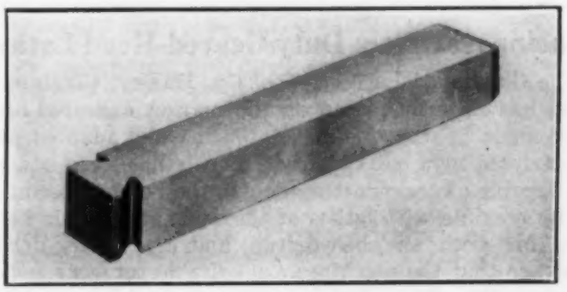
ACME OIL DRIP PAN AND HANGER

"Keytite" Self-Fitting Keys

A key that is capable of making its own fit in the keyway by shaving the sides of the keyway as it is put in place has recently been brought out by Smith & Serrell, Central Ave. at Halsey St., Newark, N. J.

It is the usual practice in the machinery industry to use keys to make the driving connection between shafts and couplings, gears, sprockets, and pulleys, and to mill or slot the keyway in the shaft and to slot the keyway in the external member. Since these two keyway sizes will vary slightly, to obtain the desired tightness between the key and keyways it is generally necessary to carefully fit the parts together. This is usually done by hand, either by filing the key to fit the keyways or by filing or scraping the keyways to fit the key, the work being expensive and time-consuming.

With the "Keytite" key, as the self-fitting key is called, no hand fitting is necessary. A tough chisel stock is used for the key, which is ground to a size very slightly larger than the nominal keyway width. A cutting edge and chip recess are provided near the front



"KEYTITE" SELF-FITTING KEY

end of the key. Ahead of these is a pilot slightly smaller than the nominal keyway width, so that it fits the keyway and guides the key.

To install the key the pilot is entered first with the cutting edge at the side, and then the key is driven home with a hammer or with a sledge, depending upon the size of the key. The cutting edge sizes the keyways to make a tight fit between the body of the key and the keyways.

In the larger sizes cutting edges are sometimes provided on both sides, as shown in the illustration herewith. When it is desired to fit on the top and bottom as well as on the sides, a cutting edge is also provided at the top. Gib keys and other modifications of keys can be furnished as required, all with the self-fitting feature. The keys can be furnished in a wide range of sizes, as to both width and length.

U. S. Electric Welder Co. Welding and Heating Transformer

The accompanying illustration shows an electric welding and heating transformer for use where hard service is encountered and high power is necessary. The device is a recent product of the U. S. Electric Welder Co., 327-8 Permanent Bldg., Cleveland, Ohio. Although the illustration shows a 15-kva. transformer for mounting in a butt welder or for heating purposes, the device is made in a variety of styles and sizes for mounting in other types of equipment.

U. S. WELDING TRANSFORMER

The supports for the primary and secondary coils and for the core are so placed as to prevent humming and shifting of any of the parts. The secondary is built up of heavy rolled copper bands spaced to provide ventilating ducts and well supported and insulated. The cooling surface provided is large enough to keep the temperature within safe limit during heavy overloads. The internal reactance automatically prevents the current from building up so that the temperature rises more than 50 deg. C. above the room temperature. The efficiency is stated to be high, reaching 93 per cent in the larger sizes.

Cincinnati Heavy-Duty Geared-Head Lathes

The Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio, has recently placed on the market a geared-head lathe made in sizes from 16 to 30 in., and adapted particularly to very heavy duty. The lathes, it is stated, are capable of transmitting double the horsepower ordinarily possible with lathes of the same size. This holds true for both the belt-driven and the motor-driven types, so that the machines are suitable for very severe service. The 16-in. lathe will transmit 9.2 hp. with a belt pull of 65 lb. per sq.in., although lathes of this size are usually run by 3-hp. motors and do not have the capacity for larger motors.

The direct-connected motor-driven lathes can be provided with either chain drive or belt drive using an idler pulley. The motor can be mounted on the headstock or in the rear of the cabinet leg. The belt drive is direct from the lineshaft to a constant-speed pulley. The control may be by means of a rod above the lathe, by a handle at the front of the head or by a lever on the apron.

A disk clutch fitted with a brake is incorporated in the drive so as to disconnect the spindle from all gearing when the machine is stopped. This removes the fly-wheel effect of large rotating gears attached to the spindle, and should be of use particularly when centering irregular work in a chuck or in machining small parts when the chucking time is a large factor in the operations.

Twelve spindle speeds can be obtained by the manipulation of three handles on the front of the head. On the 16-in. lathe the range of speeds is from 13.5 to 400 r.p.m. in geometric progression. This lathe can machine work at its maximum swing at a cut speed of 55½ ft. per min. and ¼-in. work at a speed of 54 ft. per min., so that economical cut speeds are obtainable for the complete range of work. The full range of the changes can be made in 12 seconds, it is stated.

"Iron Salesman" To Sell Black & Decker Tools

To keep its products always before prospective customers, the Black & Decker Mfg. Co., has devised what it calls the "Iron Salesman." The company is convinced that the most important factor in the sale of its products is a demonstration, and the bureau of electric tools has evolved a new idea which provides a substantial work bench upon which the units may be actually demonstrated, a back piece which carries an assortment of machines on display and pockets for booklets.

These stands are elaborate, being made of oak with a waxed finish. The side and front panels of the bench consist of colored slides. The slides are easily removable and it is planned to supply new slides for the display stands periodically. This will make it possible to keep the display constantly bright and fresh, thus eliminating the monotony of permanent panels. The stands are loaned to jobbers who are required to agree to certain terms, one of which is to keep a requisite number of B & D machines on hand. The idea is good from a merchandizing and advertising viewpoint.

Precept and Example

BY ROBERT GRIMSHAW

"Show me" has two meanings. One is "show me how," calling for instruction; the other, "show me why," implying "after you." No careless and slouchy foreman can succeed in breaking his men of careless and slouchy habits of either person or work. That is where the "show me" attitude of the men enters.

If he is a living example of clean living and conscientious work, if he can do what he asks his workers to do or show them how others have done it. If in an emergency he can take hold with promptness and vigor, he will have followers as energetic as he himself.

News Section

Cost Accountants to Hold Convention

With enormous shrinkages in inventory book values in corporate financial reports; with the great deflation which has been, and still is, in progress and with the adjustment of present-day costs of manufacturing on the basis of new wage scales and material prices as subjects of paramount importance to all industrial executives, the third international cost conference of the National Association of Cost Accountants to be held in Atlantic City, Sept. 23, 25, 26, 27 and 28, promises to attract widespread interest.

The convention will be held in the Hotel Ambassador in the seaside city and a program of exceptional interest has been arranged. Among the subjects to be discussed are the following:

1. Actual Costs as Compared with Replacement Costs.
2. Sales and Administrative Costs.
3. Standards as a Means of Reducing Costs.
4. Budgets—Their Construction and Use.
5. The Place of Costs in Business.

Drop Forging Institute's Annual Convention

The annual convention of the American Drop Forging Institute, to be held in Detroit on Oct. 3 to 6, concurrently with the convention and exposition of the American Society for Steel Treating, again emphasizes the imperative need of building up an organization commensurate with the magnitude of the drop forging industry in order that it may attain the prestige and standing in the industrial world to which its size and importance entitles it, says the Institute's Commissioners in a preliminary announcement of the forthcoming convention.

To this end, all producers of drop forgings are being invited to attend the Convention, and to participate in its proceedings on exactly the same basis as the present membership of the Institute. Misconception of the objects of the Institute, and the methods used to attain those objects, has retarded its growth and progress; and the opportunity afforded by the coming convention for all drop forgers to meet and to disciss their common interests, should do much toward correcting the situation.

The present officers of the institute are: president, J. H. Williams, president, J. H. Williams and Co., Brooklyn, N. Y.; vice-presidents, H. G. Stoddard, vice-pres. and treas., Wyman-Gordon Co., Worcester, Mass.; and O. F. Transue, pres. and gen. mgr., Transue and Williams Steel Forging Corporation, Alliance, Ohio; directors: C. E. Adams, president, The Cleveland Hardware Co., Cleveland, Ohio; F. C. Billings, president, The Billings and Spencer Co., Hartford, Conn.; C. A. Brauchler, president and gen. mgr., The Canton Drop Forging and Manufacturing Co., Canton, Ohio; Ferdinand Barnickol, president, Indianapolis Drop Forging Co., Indianapolis, Ind.; A. H. Chapin, president, Moore Drop Forging Co., Springfield, Mass.; J. F. Connelly, vice-president, The Champion Machine and Forging Co., Cleveland, Ohio.

Machine Tool Exports Show Decline in July

Metal-working machinery to the value of $1,074,371 was exported during July. This is a reduction of more than $300,000 as compared with exports in June. As compared with May, however, the July exports show an increase of approximately $180,000. Exports for July 1921 had a total value of $1,734,495. The detailed figures, which are those of the Bureau of Foreign and Domestic Commerce, are as follows:

EXPORTS METAL-WORKING MACHINERY

	June 1922	July 1922
Lathes	$84,198	$61,443
Boring and drilling machines	68,580	28,059
Planers, sharpers and slotters	52,280	33,881
Bending and power presses	31,531	7,351
Gear cutters	15,937	25,791
Milling machines	51,622	27,597
Sawing machines	6,678	1,013
Thread cutting and screw machines	17,290	16,756
Punching and shearing machines	20,685	9,581
Power hammers	3,162	8,973
Rolling machines	585	129,881
Wire-drawing machines	3,152	2,475
Polishing and burnishing machines	894	330
Sharpening and grinding machines	69,297	54,483
Chucks, centering, lathe, drill and other	13,605	17,519
Reamers, cutters, drills and other parts for machine tools	110,007	89,485
Pneumatic portable tools	30,687	41,980
Foundry and molding machinery	53,447	28,467
Other metal-working machinery and parts of	813,229	489,306
Total metal-working machinery	$1,446,866	$1,074,371
IMPORTS		
Machine tools	$26,549	$14,762

August Auto Output Gains Over July

Figures of carload shipments of automobiles reported to the National Automobile Chamber of Commerce here indicate business last month as the best on record for August. A total of 272,640 cars and trucks was manufactured by all the companies. This was an increase of 12 per cent over July and of 53 per cent over August of last year. The record production for one month is 289,120, established in June.

The report for August indicates a total of 1,671,418 cars and trucks for the first eight months of this year, compared with 1,668,550 for the entire year 1921.

Shipments out of Detroit over the Michigan Central in August were 8,557 cars. A total of 55,045 carloads was moved in the first eight months of this year as against 25,724 last year.

British Engineers Form Joint Council

Following the receipt of a message from M. Mowat of London, secretary of the British Institution of Mechanical Engineers, Charles F. Rand, chairman of the Engineering Foundation, announced that the leading engineering societies of England had formed the Engineering Joint Council, which will work with the engineers of the United States and Canada and of the other British possessions to bring about concerted action for world peace and the advancement of engineering ideals "for the good of mankind."

Mr. Rand described the organization of British engineering bodies into a single unit as a big step forward in the movement to form a world union of engineers, which already has gained great headway in France, Italy, and Czechoslovakia, direct contacts having been established by the engineering bodies of these countries with those of America.

Formation of the Briitish Engineering Joint Council, according to Mr. Rand, who with Col. Arthur S. Dwight of the A. I. M. E. was recently decorated by the French Government with the Cross of the Legion of Honor, was one of the results of the trip abroad of a mission of thirteen American engineers, headed by Ambrose Swasey of Cleveland, founder of the Engineering Foundation, to confer the John Fritz gold medal upon Sir Robert Hadfield of London and Eugene Schneider of Paris, head of the Creusot Works.

Organizations represented on the British Council, Mr. Rand said, comprise the oldest and most famous of British engineering societies, and include the Institution of Civil Engineers, Institution of Mechanical Engineers Institution of Naval Architects and the Institution of Electrical Engineers. One of the objects of the British engineers, like the objects of the American engineers, is "to secure the better utilization of their services in the country's interests."

American Welding Society's Fall Meeting

The fall meeting of the American Welding Society will be held in Chicago, Oct. 2, 3, 4 and 5, according to an announcement from the society's president, C. A. McCune.

The morning and afternoon sessions and discussions will be held in the headquarters of the Western Society of Engineers, 1735 Monadnock Block. The joint session of the American Electric Railway Association and the American Welding Society will be held in the engineering room of Congress Hall.

An interesting program has been prepared and papers will be read on a number of subjects of great importance to the welding industry.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York
(Copyright, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

SINCE the first of this month there have been celebrated the four hundredth anniversay of the first voyage around the world made by Magellan, the centennial of Brazil's political independence and the eighth anniversary of the Battle of the Marne. They were all "epoch making" events, but they would have been forgotten if the calendar had not recalled them to us. Since each of them occurred the world has been "in the depths" and "on the heights" many times but if from history we can visualize its condition four hundred, one hundred, or even eight years ago, we will realize the fairly constant progress civilization has made despite greed and war and man's inhumanity to man.

These observations are prompted by the relaxation in energy and activity that seems to be noticeable now that the coal strike is settled and the railroad strike is being ended by the gradual return of the men to work. While these strikes lasted every one said and thought that when they were over things would boom.

But the boom has not come yet and the feeling is in fact somewhat reactionary as the cost of the strikers' idleness is counted and the high prices in prospect for coal are contemplated.

But this mood will pass. The country has been under a greater strain than it realized and some reaction as the tension is relieved was natural and inevitable. It is true that our coal will cost an average of probably a dollar a ton more than it did a year ago. On our winter's consumption of probably 400 million tons this means 400 million dollars, but that isn't much to a nation that spends 400 million dollars a year for soda water and chewing gum and over a billion and a half for automobiles and their upkeep.

The truth, as I have so often affirmed, is that business activity in this country is very largely dependent on the way people feel. The population of the United States is normally energetic and constructive. Nearly every one desires to better his condition and is willing to work to that end.

Readjustments made necessary by changed conditions are from time to time necessary, but it is almost a truism that business will be active if the credit to finance its activity is available. Look over the record since the war commenced on July 31, 1914, for confirmation of this. The successive shocks of the great struggle staggered us but we always recovered our poise and hopefulness promptly and the only prolonged depression was the one caused by the curtailment of bank credit during the deflation of 1920 and 1921.

Now we have plenty of credit. The frozen loans are nearly all thawed out. The reserves of the Federal Reserve System and its member banks are so high that those who are entitled to accommodation can borrow all they need. The bigger borrowers need not pay over 4 per cent.; well secured bonds are readily salable in quantity and Secretary Mellon has found it practicable to sell Treasury certificates at 3¾ per cent. A continuance of these conditions for at least six months seems assured and that is about as far ahead as it is wise to look now or at any time.

> Labor disagreements in the railway, coal and textile fields seem now in a fair way to amicable settlement. A bountiful harvest is in prospect and a marked increase in industrial activity is being witnessed on every hand. With our own national economic household put in order, the time seems to have arrived to mold a definite foreign policy that production abroad may be stimulated, that international trade may be balanced and real—not inflated—prosperity may be enjoyed.

This is why most sagacious bankers and merchants are confident of better times ahead. They say that the people are getting down to work and they know that with work and credit to finance its products we shall make more, sell more and buy more. There are in fact many who predict inflation, though no two of them agree upon a definition of the term. When pressed for one they say that higher wages mean higher prices, followed logically by an expansion in the volume of credit and money used. This is comprehensible and reasonable, and is already exemplified in some industries.

The Steel Corporation advanced wages 20 per cent some weeks ago and now pig iron, steel rails and other steel products are up about $3.00 a ton. To get the help needed the cotton mills of New England have also raised wages and cotton textiles are noticeably firmer and higher.

It is quite possible that a general advance in all commodities may be recorded later on, but thus far it is chiefly the manufactured products that are higher. Wheat is stationary. So is cotton. In both markets buyers are waiting for the "autumnal dip" in prices that is usually due to the selling of the farmers. But in other directions where there is no great pressure to sell the markets are stiffening. Hides are firmer. So is copper. Jute and burlaps are again moving upward. Coffee is a little stronger despite the admitted selling of the Brazilian Government.

The slight decline in sugar seems to be ended. It was caused by the exaggerated emphasis put upon the inability of some small exporters of refined sugar to meet their engagements. The position of sugar is really very strong and it is attracting wider attention. As a medium of speculation it may in time rival cotton. Building material for immediate delivery is in eager demand as it is feared that railroad embargoes and freight blockades may cause a shortage. This is about the only thing that will check the building boom that enables plasterers and other workers to demand and obtain $18 or $20 a day. But it is unnecessary to elaborate. To use a musical metaphor a crescendo movement punctuated now and then by a minor "accidental" seems probable. It is the accidentals that we must be prepared for.

In the stock market it is the same story. Some speculators who held on during the strike are selling but there is no investment liquidation presently or in prospect and the indications are that for the balance of the year the market for stocks and bonds will logically reflect corporate earnings and the money market. It is impossible to particularize when hundreds of different issues are traded in each day but it seems reasonable to expect great activity and higher prices in the railway shares, for the traffic awaiting transportation is enormous and it seems certain that the roads will have more business than they can handle.

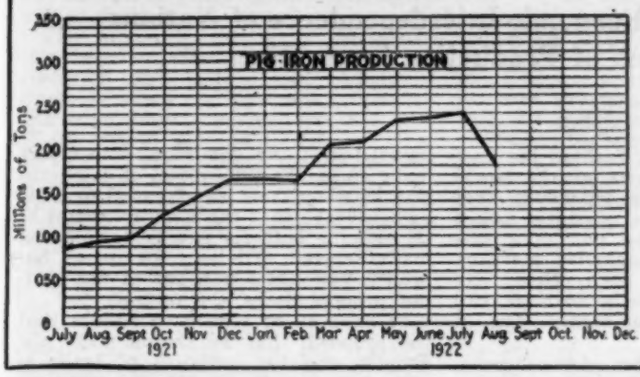
Of the political outlook in its relation to business but little need be said except that the Maine election and the primaries thus far held indicate the Administration will have a smaller and therefore a more manageable majority in the next Congress. This is reassuring.

The parturition of the tariff bill is still in progress but the community has become indurated and resigned to its absurdities. They will not be immediately felt, though they will certainly vex us later on.

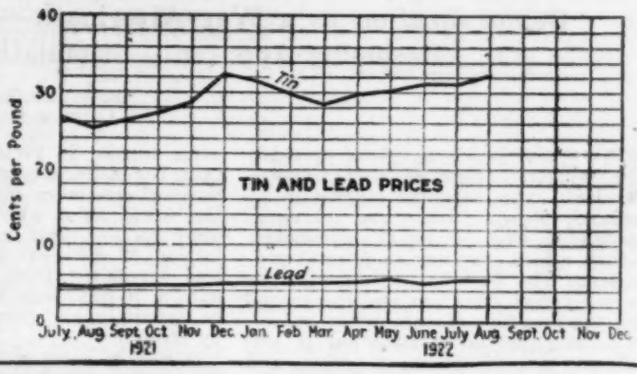
The economic morass through which Germany in particular and Europe in general is passing affords no footing for calculations in regard to future conditions abroad. By some it is asserted that the Continent is getting back to a more stable condition financially through the increased use of the dollar as currency.

It is reported that 251 billion German paper marks were outstanding on the 9th of September and on the basis of present values it is estimated that the foreigners who have bought paper marks speculatively have lost from 4 to 5 billion dollars. The American share of this loss is put at 2 billion dollars. These figures are, however, guesswork. The important fact is that Germany seems willing to print marks as long as they can be sold for more than the paper and printing cost.

Monthly pig iron production of all coke and anthracite furnaces in millions of tons, based on returns compiled by the American Iron and Steel Association.



Monthly average price of tin and lead in the New York market, based on returns furnished by Engineering and Mining Journal-Press.



RAILROAD tonnage in the week ending September 2 approached the high peak reached in October, 1920, when, in one week a total of 1,010,000 cars of revenue freight were loaded. In the week ending on September 2, a total of 931,000 cars were loaded, this figure representing a gain of 41,000 cars in seven days. The striking feature of the loadings is the fact that the gain in general tonnage loaded is greater than in the loadings of coal.

Reserve ratio of the Federal Reserve System remained unchanged at 78.3 per cent on September 13 as compared with the week previous. The ratio of the New York member declined from 83.8 per cent to 83.7 per cent. Bill holdings in the entire system totaled $591 millions, a decline of $1,612,000 from the week previous. The reserve of the Bank of England reached 19.22 per cent as compared with 18.87 per cent last week. This approaches closely the highest point for the current year of 19.97 reached on June 22, and compares with the low of 8.83 per cent on January 7.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

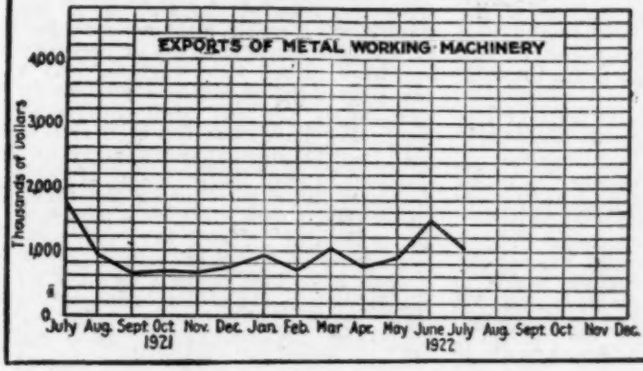
	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.0285	$0.0266	$0.0273
Cold finished shafting.....	per lb.....	0.0373	0.0355	0.0396
Brass rods.....	per lb.....	0.170	0.1650	0.1400
Solder (½ and ½)	per lb.....	0.228	0.221	0.202
Cotton waste..	per lb.....	0.115	0.11	0.113
Washers, cast iron (½ in.)...	per 100 lb.	4.00	4.00	4.66
Emergy, disks, cloth, No. 1, 6 in. dia.....	per 100.....	3.11	3.11	.....
Lard cutting oil	per gal.....	0.575	0.575	.....
Machine oil....	per gal.....	0.36	0.36	.....
Belting, leather, medium.....	off list.....	40–5% @50%	40–5% @50%	
Machine bolts up to 1 x 30 in.	off list.....	55% @60%	50%@ 65–10%	50%@ 60–10%

Crop values, as estimated by the Department of Agriculture, for the current year on six principal crops, will total in the neighborhood of $5¾ billions. Corn leads, the prospective yield being estimated as worth nearly $2 billions. The hay crop is second, valued at $1,160 millions, with cotton following closely in third place valued at $1,118 millions. Wheat is fourth, valued at $721 millions; potatoes fifth, valued at $502 millions and oats last, $404 millions. With these yields in sight the buying capacity of 6 million farmers this fall appears greater than at any time during the past two years.

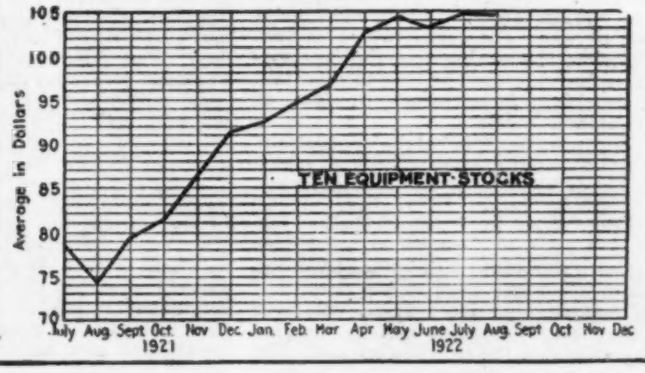
Labor rates prevailing in the metal working industries, reported during the week, show that in Philadelphia tool makers are being paid from 55 to 80 cents, bench and lathe hands from 45 to 80 cents. Cleveland reports rates for tool makers ranging between 50 and 75 cents; bench hands, between 40 and 60 cents and lathe operators from 85 to 55 cents. Detroit reports 75 to 80 cents for tool makers; 50 to 55 cents for bench hands and 70 to 75 cents for lathe operators. In the New York district tool makers are being paid 75 to 80, while bench and lathe hands are receiving not less than 60 cents.

American foreign trade for the month of July, according to the foreign trade index figures just published by the Federal Reserve Board, eliminating the price factor, shows that our exports and imports for the month compare favorably with the pre-war volume. Based on an index figure of 100, as indicating the physical volume of our exports in July, 1913, the index figure representing the volume of exports for July, 1922, stands at 95.0. This compares with the index figure for the previous month of 107.4. Imports declined in volume also, the index for July being 187.7 as compared with 191 in June. Expressed in dollars and cents, on the other hand, exports for July were valued at $305 millions as compared with $325 millions in July, 1921. Imports in July were valued at $251 millions as compared with those of July, 1921, valued at $178 millions.

Total value of all metal working machinery exported monthly from the United States, based on returns compiled by the Bureau of Foreign and Domestic Commerce.



Monthly average: Am. Brake Shoe; Am. Car and Fdy.; Am. Loco.; Baldwin; Lima Loco.; N. Y. Airbrake; Pr. Steel Car; Pullman; Ry. Steel Spring; West. Airbrake.



The British Machinery Industry

Demoralization as a War Aftermath—Economic Interdependence of Nations Becoming Apparent—Stimulation of Production Imperative

By Henry E. Obermeyer and
Arthur L. Greene

TWO clouds are hovering over the industrial horizon, and particularly the machine industry of England, today. Both are of equal importance and of equal seriousness as they affect a return to normal production. The first has to do with the unemployment situation and the second with the question of specialization.

The unemployment situation is undoubtedly one of the most serious and most portentous that the machine industries of England have had to face since the war. The number of machinists, or, as they are called here, engineers, out of work has decreased but slightly during the past six months. In not a few instances, the number is steadily increasing day by day. This demoralized state of affairs is primarily due of course to the chaotic condition of European finances which has decreased purchasing power to an alarming extent and brought even the staunchest of nations to the verge of bankruptcy. Until some outlet for the manufactured products of England is found, such as is hoped for when the Russian market reopens, both the Government and the individual employers themselves see little hope for a return to normal production and normal peace time employment.

Machinists Wages Cut Severely

At the moment the machinists of the country are faced with the alternative of either taking another reduction in wages or of being thrown out of employment altogether. The wage of the average skilled mechanic averages some three pounds per week. The contemplated decrease which the employers have been forced to announce, will amount to 15s. 6d. per week, to take effect at the rate of 5s. 2d. per month for the next three months until the total reduction is in force. A vote among the employees is now in progress to determine whether or not the decrease will be accepted. From present indications, a compromise appears likely to be the result. This instance is cited merely to show in graphic detail the extremities to which the machine industry of England has been forced. No one, including the employes themselves, criticize the manufacturers in ordering the decrease. That it is a matter of necessity is too apparent. But just how the employee is to subsist on his two pound, ten a week or so is a question which is just as vital to the workman as is the question to the employer of how to maintain his working force intact in face of diminishing orders.

The phrase, "normal production" brings to mind a state of affairs which the English machine manufacturer has only lately begun to realize. It is, namely, that the manufacturer can never hope for a return of conditions anything like those obtaining before the war. And when more stable conditions are established, the normal, whatever it may be, it is said, will be entirely different from the pre-war normal. The English manufacturer has had brought home to him in vivid fashion the fact that the different parts of the world have grown more interdependent, that the world as a whole must be looked upon as one unit and not as a collection of different countries more or less separated from each other. No nation, it has come to be realized, can be definitely and permanently shut off by itself.

A case in point is that of the increasing competition felt by machine manufacturers in England from German sources. For several years after the war the opinion was held more or less generally in the British Isles that the Germans would be cut off from the other nations "behind a ringed fence, together with the lepers and wastrels of the world." No one realizes today better than does the English manufacturer the fallacy of such a belief. The sum and substance of the situation was ably expressed recently by a well-known English manufacturer: "If a nation is not exterminated it must be lived with and if it must be lived with it must be traded with. Not only must we sell to this nation, but we must in return take something from it. The only point to be decided is what goods or produce we are to take from any particular country and what goods we are to produce ourselves for export to that country, as well as for our own consumption."

Another fact but recently brought home to the English machine manufacturer, as a direct result of the existing stagnation in the industry, is that former customer countries are doing more and more of their own manufacturing, and on the other hand that competitor countries are developing and increasing their export trade. Today competitors in the United States, Japan, etc., are making a strong, and, in many instances a successful, bid for the trade of continental European countries where, in pre-war days, England had an undisputed monopoly.

Unemployment Problem Perplexing

The difficulties confronting the machine industry of England are often likened to the scattered pieces of a jig-saw puzzle. English manufacturers are confronted with the necessity of slowly and laboriously piecing it together again. But even this comparison hardly gives a comprehensive idea or measures the difficulties looming in front of the manufacturing interests of England today. For, whereas, when the jig-saw puzzle is pieced together again the original picture appears upon its surface, when at last the world is more or less settled down and readjusted, an entirely different picture will be presented.

The daily press of the country is devoting columns of space to discussions of the present unemployment situation. The latest method suggested for its solution is that known as the scheme for trade within the Empire, which, to quote the words of its advocates, "is the most effective remedy for unemployment that can be devised." It is, in short, a system that would bring the industries of the dominions into closer unity and make the system of co-operation between them so essential to their own welfare that the Empire would be all-sufficing both for raw materials and manufactured articles. To quote but briefly Viscount Long, one of the leading proponents of the method:

"I have every reason to believe that the proposal that we should make the Empire one for purposes of trade is attracting a considerable measure of support both at home and in the various overseas dominions. I want to see the Empire devoting itself to such a provision of materials, in the parts of the Empire where they are wanted, as will enable trade and industry within the Empire to be carried on successfully and will demonstrate, what I believe is a fact, that the Empire can supply herself with everything she wants.

"That view is shared by the leading representatives of our dominions. We have adopted, as I think most wisely, a system of Imperial Preference under which we have also undertaken to give a similar preference in connection with any new duties that may be imposed from time to time.

Side Line Production Advocated

"Having consolidated our own position and made the Empire one for the purposes of trade and commerce, we can then turn our attention to our Allies and by arrangement, give them a share in the products of the Empire. Our own needs—from no selfish motive, but purely from the point of view of self protection—must come first. All we want is that the Empire should be all sufficing, both for raw materials and manufactured articles but to leave the actual distribution and use of these products to the traders and business men of the Empire. This movement will tend to dissipate the unfortunate notion that for a man to move, say, from England to Canada or Australia is to cut himself adrift and make himself an exile from home."

This excerpt but goes to show that the industrial world of England today is coming around to the theory so long and so often advocated in America,—namely, home production for home consumption. Just what success will attend its introduction in England, remains to be seen.

For some years past, in fact dating from the time of the signing of the Armistice, English machine manufacturers have made a virtue of necessity and have turned their energies into a great diversity of side-line production. Fortunately for their own welfare at least, they have thus far been able to keep their factories at part time production and to keep the personnel of their factories intact by turning the facilities of their plants to different purposes. Other lines of industry have not, however, been so fortunate and in consequence have had to shut down their plants, and in not a few instances declare themselves bankrupt. The machine tool makers, however, early discovered that their plants were able to

turn out many of the smaller accessory parts needed in other industries and lost no time in grasping the opportunity laid at their door.

The motor industries in particular have been the salvation of many. Visit virtually any machine tool factory in England today and you will invariably find from fifty to seventy-five per cent of the output devoted to side-line production. Only a very small part of their plant will be found engaged in the production of machine tools and generally even this production will be found centered in experimental processes of new design and construction. It is no exaggeration to say that side-line production of many of the smaller parts which go into the making of automobile motors has kept the machine factories running at part or full time and is thereby enabling them to tide themselves over the industrial crisis. The situation, however, even at its best, is admittedly precarious and hardly better than a hand to mouth existence for the time being.

Specialization to Increase Activity

The many vital problems which have thus arisen as a result of this unemployment situation have brought in their train many innovations in the ways and means of manufacturing in England in an attempt to alleviate the situation. One of the earliest methods tried and still being utilized to a large extent, is that of specialization in manufacturing. Specialization here, in the true sense of the word, is by no means an innovation, but it is new in the sense that only within the past year has it been tried to a very great extent and been tried in practically all its phases.

The particular kind of specialization, around which so much controversy is being waged in the industrial world of England at present, is not that as generally applied to the workman but that as applied to a factory unit. It is the common belief among manufacturers of all kinds and grades, that specialization as practiced by Henry Ford in our country can never be successfully applied in England, either now or in the future. Their reason for making such an unqualified assertion is not based on the physical difficulties which would attend such an introduction as it is on the knowledge of the English workingman's temperament. As one factory manager explained: "The policy so common in an American factory of turning the human element or factor into a mere cog or adjunct of the machine he is operating is something to which the English factory hand would seriously object to. From our own standpoint even, we would find serious objections to this kind of specialization. We feel that with the introduction of such a system the workman loses that sense of responsibility which we always try to instill in the minds of our employees, from the lowest to the highest."

The foregoing opinion was found to be very generally concurred in. Group specialization by individual factories or units is quite a different matter, however, at least from the viewpoint of the English factory employer. The modern English exponent of this kind of specialization has proved to his own satisfaction at least the advantages of the system, but mention to him specialization by the individual and he will be found to be even more radical in his views than the out and out opponent of all and every kind of specialization.

To date it is almost impossible to judge of the success or failure which has attended the introduction of factory specialization in England. Perhaps the one positive reaction which has made itself apparent thus far has been the division of the machine industry of England in two camps, one in favor and one violently opposed to its introduction.

The objections to this method among English industrials lie principally in the recognition of the diversity of consumer needs as represented by the export trade. Before the war, the output of English machine tool factories was for the most part exported to the various Continental countries. While the amount exported to each country was of comparatively small volume, the total consumed by the entire nations of Europe was of considerable size.

It is easy to understand that the needs and types of tools demanded by the industry of each country should vary considerably. A machine tool demanded by a French silk manufacturer, for example, would necessarily be quite different from that demanded by the German steel manufacturer. As a result, the manufacturer,—and in this case the English tool manufacturer,—found himself unable to make any considerable number of standard tools, but had on the other hand to take a great number of small orders, each demanding a different type and size machine tool.

The situation today is hardly different in this respect from what it was in pre-war days. If anything, some machine tool manufacturers claim that the demand is not only for smaller quantity orders, but of even greater diversity as well. As Mr. John W. Earle, a well-recognized metal expert both in England and in America and head of the Earle-More Company, Ltd., manufacturers of non-ferrous metal castings, explained:

"The reason you in America can go in for mass production and specialization is for the simple reason that everyone takes in everybody else's washing. With us it is quite a different matter. We cater, and have of necessity to cater, to a dozen different nationalities, each demanding something entirely suited to its own particular needs. Under these circumstances what chance would Henry Ford have in this country?"

Machine Builders Co-operating

Judging from surface appearances only, following a visit to the industrial plants in the cities of Manchester, Birmingham and Leeds, it would appear that the exponents of specialization have undoubtedly the better of the argument for the time being at any rate. Their success has had its foundation based on the need for closer co-operation, a need which had its origin in the recognition of the dangers arising from ever growing foreign competition as exemplified in the increased facilities for communication. But while this latter factor has to some extent been disadvantageous to the trade of English machine tool manufacturers, it has also been of advantage to them. In other words, while increased facilities for communication have brought foreign competitors nearer to the English market, it has also worked to bring the foreign markets nearer to the English trades.

The factor of closer world interdependence was early recognized and utilized to their own advantage by the machine tool manufacturers of England. As early as 1916 an association known as the Associated British Machine Tool Makers was formed which included in its membership twelve of the largest manufacturers of machine tools in the country. Its purpose was not monopolistic in any sense of the word, inasmuch as it did not have for its object, either stated or implied, the purpose of excluding others engaged in the same line of industry. It was primarily formed for purposes of greater efficiency in manufacturing, the elimination of huge, unwieldly and expensive sales forces and of giving to each member of the association a particular field in machine tool making which the other eleven members would voluntarily agree to cease manufacturing. In short it made each member firm of the association but one department in the manufacturing of certain kinds of machine tools and thereby made of what had hitherto been twelve small unrelated manufacturers all engaged in competitive lines with each other, a unified whole, each department specializing in its own selected branch of machine tool manufacturing.

As an example, the H. W. Ward Co. agreed to specialize solely in capstan and turret lathes and to maintain through the association one sales manager in the central office of the association. Thus every order that came in, irrespective of which salesman received it, was to be put to the credit of whatever member firm of the organization made the particular tool called for.

The results attained have fully justified this organization. It has decreased in no small degree the sales expenses of the twelve member firms and what is no less important, it has, by eliminating some of the useless competition, enabled the tool manufacturers to devote considerable time toward making improvements in their special line of manufacturing. The Ward Co., in particular, has through its specialization introduced some features in capstan and turret lathes which have made their product unique.

To just what extent this form of factory specialization in England will grow in the future remains to be seen. The facts as developed so far, however, would seem to warrant a continuation of the method, and aside from the very reasonable objections raised by its opponents, it hardly seems an exaggeration to say that within the next few years specialization of this kind will become as great a factor in the industrial life of the country as was formerly the unrelated and competitive methods employed in pre-war days.

French Iron and Steel Trade Shows Gain

According to cable to the Department of Commerce from Acting Commercial Attache, John F. Butler at Paris, steady improvement in practically all lines of iron and steel is noted in France.

August rail sales were the best since the commencement of the year. Sales of foundry pig iron are on the increase.

Production of pig iron and steel during the seven months ending July was 2,689,000 and 2,413,000 metric tons, respectively.

Machinery Duties Under the Tariff Bill

WASHINGTON CORRESPONDENCE

Machine Tools. Machine tools and their parts are made dutiable at 30 per cent ad valorem in the tariff bill which has been agreed upon after conferences between representatives of the Senate and of the House of Representatives. In the House bill machine tools and their parts were made dutiable at 35 per cent to be based on American valuation. This was reduced in the Senate to 15 per cent ad valorem, based on foreign valuation. A compromise was effected whereby the rate was altered to 30 per cent ad valorem on the basis of foreign value.

Automobiles and Cycles. The bill passed by the House provides that if any country imposes a duty on automobiles or parts, when imported from the United States, in excess of the duty imposed by the United States on such articles, that the American duty shall be equal to that imposed by such a country, but in no case to exceed 50 per cent American value. The Senate struck out the House provision, but in conference it was restored, with the proviso that the maximum rate may not exceed 50 per cent on the foreign value. The same course was taken on paragraph covering motorcycles and bicycles.

Sewing Machines. The Senate amendment to the bill imposes a duty of 25 per cent, based on foreign value, on sewing machines and parts, when valued at not more than $75. A rate of 40 per cent, foreign value, was prescribed for sewing machines having a value greater than $75. The House had put sewing machines on the free list. In conference, however, the House agreed to strike sewing machines off the free list provided the duties were made 15 per cent and 30 per cent respectively, on the basis of foreign valuation.

Cash Registers. The House had put cash registers on the free list. The Senate imposed a duty of 25 per cent. In the conference the House representatives accepted the Senate rate.

Typewriters and Typesetting Machinery. Typewriters, typesetting machines, shoe machinery, sand blast machines, sludge machines and tar and oil spreading machines used in road construction and preservation, as well as their repair parts, were retained on the free list. Combined adding and typewriting machines were made dutiable at 30 per cent ad valorem in the conference bill, whereas the rate prescribed for the basket clause for machines and parts is 30 per cent ad valorem, a reduction of 5 per cent from the rate adopted by the Senate.

Knitting, Braiding and Insulating Machines. A duty of 40 per cent ad valorem, based on foreign value, was agreed to for knitting, braiding and insulating machines. The House bill imposed a duty of 35 per cent, American value, on embroidery machines, lacemaking machines, and machines for making nets and nettings. The Senate lowered this rate to 30 per cent, based on foreign value. In conference the House rate was allowed to stand, with a change from American to foreign valuation.

Agricultural Implements. Agricultural implements, with the single exception of cream separators valued in excess of $50 each, remained undisturbed on the free list. These separators, as well as other centrifugal machines for the separation of liquids, were made dutiable at 25 per cent ad valorem.

Special Steel. The House conferees agreed to accept the Senate rates on steel containing molybdenum and tungsten. The additional duties which these steels therefore will pay are 65 cents per pound on the molybdenum content in excess of six-tenths of 1 per cent and 72 cents per pound on the tungsten content in excess of six-tenths of 1 per cent.

Small Tools. Pliers, pincers and nippers of all kinds, finished or unfinished are dutiable at 60 per cent ad valorem, regardless of length. The House bill had prescribed varying duties on these tools, according to their length. The rate on files, file blanks, rasps and floats was not considered in the conference as no changes were made in the rates prescribed by the House, which were: two and one-half inches in length and under, 25 cents per dozen; over two and one-half and not over four and one-half inches, 47½ cents per dozen; over four and one-half and under 7 inches in length, 62½ cents per dozen; seven inches in length and over, 77½ cents per dozen.

Elwood Steel Co. Buys Sharon Steel Plant

According to reports from Elwood City, Pa., the Elwood Steel Co. has purchased the plant of the Sharon Pressed Steel Co.

The plant acquired by the Elwood company adjoins the present realty holdings of that concern, and will be used in enlarging the present plant. During the war this plant was occupied by the Solid Drawn Forge Co., and some time ago the property was sold to J. A. Gelbach, J. J. Dunn, D. E. Moore.

When incorporation papers were taken out a few weeks ago, the capitalization of the company was increased to $250,000. With this additional working capital and the increased room for larger manufacturing facilities, officials in charge of the concern state they soon expect to be making 30,000 kegs of nails per month.

Officials of the company are: George E. Blyth, president; John J. Tyler, vice-president; August Miller, treasurer; Ira Bixler, secretary.

American Brake Shoe Forms New Subsidiary

According to reports recently made public, the directors of the American Brake Shoe and Foundry Co. have formally approved the plan for the formation of a new subsidiary to be known as the Ramapo Ajax Corporation to acquire properties of the Ramapo Iron Works with plants at Hillburn and Niagara Falls, N. Y., and Niagara Falls, Ont., and the Ajax Forge Co., with plants in Chicago and Superior, Wis. The plan provides for the sale of $2,250,000 first mortgage 20-year 6½ per cent bonds, which have already been underwritten.

Southern Iron Prices Advancing

The Southern Metal Trades Association advises that spot pig iron has continued to advance steadily in price at the Birmingham market, having reached as high as $28 per ton for No. 2 foundry iron, with some sales for shipment into northern markets at $27. Numerous inquiries are reported with furnaces operating steadily to keep up with demand. The only retarding feature at the time is the railroad strike, and the situation is improving steadily. While no sales for 1923 delivery of pig iron have been reported, inquiries are coming in. Unofficial reports indicate production in the Alabama district in August to have been well above July.

Post Office Plans Repair Depot for Aircraft in Chicago

Bids for an airplane repair and assembly depot and two hangars at the Speedway field, Chicago are being advertised by the Post Office Department.

The depot for mail planes which has been in operation for two years is on property surrendered by the Post Office Department. Permission has been granted to build on the Speedway park adjoining. The depot makes major repairs on damaged airplanes for all three divisions of the air mail service. Besides this an average of eight remade planes are being assembled every month for use in the service or for storage at reserve stations.

The depot, which will have 58,100 sq.ft. of floor space will contain a warehouse, garage, test stand room, factory and assembly room. The building will be two stories high. The two hangars will be 100 feet by 100 feet. The improvements will give the air mail service altogether 78,100 sq.ft. of floor space. It is estimated that this increase in facilities will accommodate present needs and allow some expansion in the future at the central field of the trans-continental air mail service.

Surplus Freight Cars Decrease

Reports furnished by the car service division of the American Railway Association from the rail carriers of the country showed that there were 70,455 surplus freight cars on Aug. 31. This was a decrease of 50,506 since Aug. 23. A surplus freight car is one which is in good repair but which is not needed to meet current freight requirements.

Surplus coal cars totaled 54,566 cars, a reduction since Aug. 23 of 41,839, while surplus box cars numbered 3,850, a decrease within the same period of 4,387 cars.

There was also a reduction in slightly more than a week of 926 in the number of surplus coke cars, the total being 1,982, while surplus stock cars totaled 3,091, which was 1,589 less than on Aug. 23. A reduction within the same time of 797 in the number of surplus railroad owned refrigerator cars was also reported.

Machine Tool Exhibit Creates Widespread Interest

Late reports reaching this issue of *American Machinist* indicate that the second annual machine tool exhibition, to be held in the Mason Laboratory of Yale University, New Haven, Conn., September 21, 22 and 23, has met with extraordinary support from the machinery builders. At this writing 110 firms have signified their intention to exhibit their products as follows:

NAMES OF EXHIBITORS

Brown & Sharpe Co., Providence, R. I.
National Acme Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Pratt & Whitney, Hartford, Conn.
R. & J. Dick Co., Inc., New York City.
Elec. Alloy Steel Co., Youngstown, Ohio.
C. E. Johannson, Inc., Poughkeepsie, N. Y.
Rivett Lathe & Grinder Co., Boston, Mass.
Leland Gifford Co., Worcester, Mass.
Rhodes Mfg. Co., Hartford, Conn.
Kingsbury Machine Tool Co., Keene, N. H.
Abrasive Machine Tool Co., E. Providence, R. I.
The Haynes Stellite Co., New York City.
The Warner & Swasey Co., Cleveland, Ohio.
Joseph T. Ryerson Co., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Standard Shop Equipment Co., Philadelphia, Pa.
The Noble & Westbrook Mfg. Co., Hartford, Conn.
Cronin-Waddell Co., Boston, Mass.
Educational Exhibition Co., Providence, R. I.
Eastern Mach. Screw Co., New Haven, Conn.
Puriton & Smith, Hartford, Conn.
Standard Safety Mfg. Co., New Haven, Conn.
Manning Abrasive Co., Troy, New York.
Peerless Surfacing Mach., Co., Troy, N. Y.
Royal Waste Co., Rahway, N. J.
Alexander Brothers, Philadelphia, Pa.
Hoggson & Pettis, New Haven, Conn.
Standard Machinery Co., New Haven, Conn.
Martin Machine Co., Turners Falls, Mass.
American Society of Mechanical Engineers, New York City.
Seneca Falls Mfg. Co., Seneca Falls, N. Y.
B. C. Ames Co., Waltham, Mass.
Sidney Mach. Tool Co., Sidney, Ohio.
Walls Sales Corp., New York City.
Royersford Mach. Tool Co., Royersford, Pa.
Anderson Machine Co., Bridgeport, Conn.
Bickford-Switzer Co., Greenfield, Mass.
Cincinnati Elec. Tool Co., Cincinnati, Ohio.
Wisconsin Electric Co., Racine, Wis.
Detroit Twist Drill Co., Detroit, Mich.
J. D. Wallace Co., Boston, Mass.
Charles H. Besley Co., Chicago, Ill.
Grant Mfg. Co., Bridgeport, Conn.
American Milling Mach. Co., Cincinati, Ohio.
Sellew Mach. Tool Co., Pawtucket, R. I.
Hergi Mfg. Co., Bridgeport, Conn.
Bonner & Barnwall, New York City.
Athol Machine Co., Athol, Mass.
E. C. Atkins & Co., New York City.
Clinton E. Hobbs, Boston, Mass.
General Electric Co., Schenectady, N. Y.
Oven Equipment Co., New Haven, Conn.
Iron Age Publishing Co., New York City.
Jacobs Mfg. Co., Hartford, Conn.
Monarch Mach. & Tool Co., Sidney, Ohio.
Imperial Belting Co., Chicago, Ill.
American Machinist (Publishers), New York City.
Wright Mfg. Co., Lisbon, Ohio.
Skinner Chuck Co., New Britain, Conn.
New Haven Electric (Radio), New Haven, Conn.
Union Twist Drill Co., Athol, Mass.
Card Tap & Die Co., Mansfield, Mass.
The Carborundum Co., Niagara Falls, N. Y.
L. S. Starrett Co., Athol, Mass.
The Industrial Press Co. (Mach.), New York City.
Van Norman Mach. Co., Springfield, Mass.
Power, New York City.
Industrial Engineer, New York City.
S. K. F. Industries, Inc., Hartford, Conn.
Dodge Sales & Engineering Co., Mishawaka, Ind.
Johnson Belting Co., New York City.
J. T. Welch, New Haven, Conn.
H. G. Thompson & Sons Co., New Haven, Conn.
J. M. Ney Co., Hartford, Conn.
J. L. Lucas, Bridgeport, Conn.
Reed Prentice Co., Worcester, Mass.
Chamber of Commerce, New Haven, Conn.
Kilborn & Bishop, New Haven, Conn.
E. Horton & Son Co., Windsor Locks, Conn.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Universal Boring Mach. Co., Hudson, Mass.
Norwalk Iron Works, Norwalk, Conn.
Taylor and Fenn, Hartford, Conn.
Taft Peirce Co., Woonsocket, R. I.
Westcott & Mapes, Inc., New Haven, Conn.
J. T. Slocumb, Providence, R. I.
Madden & Morrison, Providence, R. I.
Hill Clark & Co., Boston, Mass.
(F. M. Lord, Box 764—N. H.)
Hartford Mill Supply Co., Hartford, Conn.
Cochran & Bly, Rochester, N. Y.
Jones & Lamson Mach. Co., Springfield, Vt.
A. F. Way Co., Hartford, Conn.
Page, Steel & Flagg, New Haven, Conn.
Builders Iron Foundry, Providence, R. I.
E. W. Bliss, Brooklyn, N. Y.
Eastern Sales Co., Boston, Mass.
Torrington Co., Torrington, Conn.
Standard Steel & Bearings, Inc., Plainville, Conn.
Detroit Belt Lacer Co., Detroit, Mich.
American Swiss File & Tool Co., Elizabeth, N. J. (26 John St., N. Y.)
Keller Mech. Engraving Co., Brooklyn, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Walworth Mfg. Co., Boston, Mass.
Vitrified Wheel Co., Westfield, Mass.
(Page Steel & Flagg Co.)
Eastern Machinery Co., New Haven, Conn.
N. H. Gas Co., New Haven, Conn.
Gallophone Co. of N. Y., 151 Grand St., New York City.
Callophone Co. of N. Y., New York City.
Standard Steel & Bearings, Inc., Philadelphia, Pa.

Business Items

The Saco-Lowell Co., Lowell, Mass., one of the largest manufacturers of textile machinery in the country, will establish a branch plant at Charlotte, N. C., representing about a $150,000 investment. Work on the plant already is in progress.

The Powers Accounting Machine Corporation, St. Louis, Mo., has been incorporated with a capital stock of 1,000 shares of no par value. The company will do a general accounting and tabulating machine business. The incorporators are M. A. Bruce, C. H. Blaske and F. R. Bogart.

The Potosi Pipewrench Co., Potosi, Mo., has been incorporated with a capital stock of 500 shares of no par value. The company proposes to manufacture or sell state or county rights to manufacture or sell the company's pipewrench products. The incorporators are J. M. Cooper, S. M. Kathcart, W. H. Cooper.

The Stewart Warner Co. announces that all of the $2,000,000 of 8 per cent notes due March 1, 1925, have been retired. Practically the entire amount was converted into stock at the rate of 25 shares of stock for each $1,000 bond. Conversion, however, has not increased the outstanding capital stock, the company having purchased stock equal to the amount converted, in the open market.

The United States Steel Corporation has increased to $43 a gross ton the price of steel rails, effective October 1, and covering deliveries for the first half of next year. The present prices of $40 a ton, which was announced in October of last year, represents a reduction of $7 per ton from the level obtaining from March, 1919, until that time.

The Fulton Machine Tool Co., 1422 W. Randolph St., Chicago, Ill., has been reorganized and will be known as the Fulton Machine Co. The plant is being moved to larger quarters at 1525 Dayton St., where the firm will engage in contract manufacturing and the building of special machinery.

The Chicago, Rock Island and Pacific Railway Co. has been granted authority by the Interstate Commerce Commission to issue $1,000,000 of first and refunding mortgage gold bonds. The issue will be sold at not less than 83.50 per cent of par and the proceeds used for paying off indebtedness, including equipment trust obligations for additions and betterments, and for general corporate purposes.

The M. S. Little Manufacturing Co., Hartford, Conn., and the A. J. Beaton Manufacturing Co., New Britain, Conn., according to recent reports, are to be merged into a new organization to be known as the M. S. Little Manufacturing Co. The stockholders of the two companies are to meet in New Britain in the near future for the purpose of aproving of the plan.

The Chicago, Milwaukee and St. Paul Railway Co., in its report for June, shows operating revenues of $13,513,555, an increase of $1,160,554 and net operating income $1,215,104, an increase of $408,014. For six months ended June 30 operating revenues were $71,156,775, an increase of $3,387,195 and net operating income $1,617,155, an increase of $4,432,878.

The Vanadium Corporation of America, according to its chairman, J. Leonard Replogle, will show a net income for August in excess of $90,000 after deducting all charges.

The Casey Hedges Co., of Chattanooga, advises that it has lately acquired a site of about 50 acres on which will be constructed a new plant for the manufacture of boilers and plumbing supplies, to operate in conjunction with the present plant of the company.

The Louisville and Nashville Railroad Co. reports a net operating income for June of $2,619,409, bringing the total net operating income for the six months' period up to $9,839,446.

The Oilgear Co., Milwaukee, Wis., announces the appointment of the R. E. Ellis Engineering Co., 621 Washington Boulevard, Chicago, as its representative in the sale and distribution of Oilgear products in Chicago and the surrounding district.

The San Diego Iron Works, the successor to the California Iron Works, at San Diego, Cal., will manufacture the "California hydrant," for which it holds the patent. The new corporation is planning an extension of its business, specializing in structural iron, metal work and machinery.

The Canadian Pacific Railway Co.'s net operating revenue for June, amounting to $2,362,313, represents a decrease of $742,445. The half yearly period shows net revenue of $9,814,070, a decrease of $3,136,096.

Alfred Box and Co., Inc., Philadelphia, Pa., manufacturer of electric traveling cranes and hoists, announces the opening of a direct factory branch office at 30 Church Street, New York City. N. C. FAILOR will be in charge.

The Denver and Rio Grande Western Railroad Co. for June reports operating revenues of $2,737,227, an increase of $878,729 and net operating income $482,302, an increase of $1,120,360.

The Milne Foundry Corporation of Schenectady, N. Y., has been chartered recently at Albany, N. Y., with a capital of $100,000 for the manufacture of fuel saving devices, as well as engines, motors and machinery equipment used in connection therewith. The

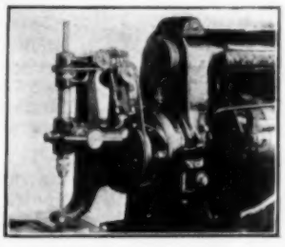
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Attachment, Spotting and Routing, K-N

E. L. Krag & Co., 50 West Randolph St., Chicago, Ill.

"American Machinist," Oct. 6, 1921



The attachment is intended for the laying out and drilling of holes up to and including 3/16 in. in diameter in dies and work that require great accuracy. The method of performing the work is intended to replace that of locating holes by means of buttons. The device can be supplied for all standard makes of milling machines, being ordinarily attached to the No. 1, 1½ and 2 sizes. The spindle is fed by hand, and a locking device is provided so that it can be securely fastened at any height. The spindle pulley and idlers are fitted with ball bearings. The work is moved under the attachment by the use of the feeds on the table of the milling machine.

Milling Machine, Bench, Hand, No. 3

Pratt & Whitney, Hartford, Conn.

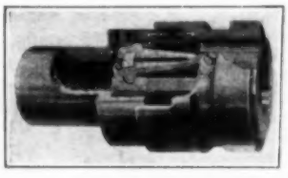
"American Machinist," Oct. 6, 1921

The machine is only 21 in. high and occupies a bench space of 22 x 25 in. The spindle is of tool steel, as is also the double taper front bearing. The rear bearing is of bronze, and both bearings are adjustable to compensate for wear. Spindle speeds range from 133 to 1,510 r.p.m. A three-step cone is provided. The table has a working surface of 2¾ x 17½ in. It has both screw and rack movement. The saddle has a crosswise movement of 2 7/16 in. and the knee may be adjusted vertically through a range of 6½ in. Net weight, 185 lb.

Clutch, Friction, Locking

Carlyle Johnson Machine Co., Manchester, Conn.

"American Machinist," Oct. 6, 1921

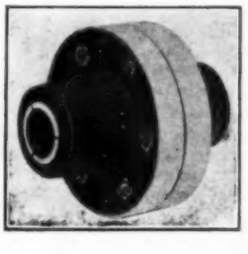


This friction clutch has been provided with a positive locking feature, so that slippage can be prevented after the clutch is completely engaged. When first thrown into engagement, the action of the device is the same as on the standard clutch. When the clutch has been completely engaged, and the speed of both parts is the same, pins on the outside shifter sleeve move up so as to engage those on the clutch itself, there being six pairs of pins spaced around the clutch. When disengaging the clutch, the pins are brought out of contact, and then the clutch can be slipped or disenguged entirely.

Couplings, Shaft.

Hilliard Clutch and Machinery Co., Elmira, N. Y.

"American Machinist," Oct. 6, 1921



The illustration shows the keyless compression coupling. The coupling consists of two flanges bored tapered, and one slotted sleeve turned on the outside with tapers to match the flanges. When the flanges are drawn together by means of bolts, the shafts are gripped tightly, so that slippage is prevented. The coupling is made in a range of sizes. A keyed flanged coupling is also made in a range of sizes. For connecting shafts of different sizes, reducing couplings can be furnished.

Grinder, Floor, Electric, "Pioneer"

The Louisville Electric Manufacturing Co., Louisville, Ky.

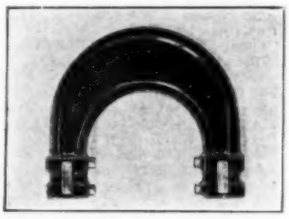
"American Machinist," Oct. 6, 1921

The motor is ventilated, the air intake being so located that clean air is drawn through it. The machine is provided with ball bearings. Steel safety hoods are provided, with hinged side walls so that the wheels can be easily changed. The tool-rests are adjustable. The starting switch for the motor is enclosed in the column, and a water pot can be attached. The grinder requires a 2-hp. motor, which can be furnished for either direct current or 60-cycle alternating current, the no-load speed being 1,800 r.p.m. for either type. The wheels used are 12 x 2 x 1 in. in size. Weight, 400 pounds.

Gage, Snap, Adjustable-Limit, Syracuse

Meldrum-Gabrielson Corporation, Syracuse, N. Y.

"American Machinist," Oct. 6, 1921

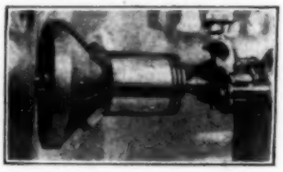


The chief feature of the gage is the locking device for the measuring pins, which are square in section. The shape of the pins prevent them from turning. The square pins in the Style A gage shown present a straight edge to the work. The pins of the Style B gage are equipped with rectangular anvils for use when measuring against shoulders. The Style G gage employs, instead of the usual "go" and "no-go" pins, three pairs of pins. The gage size is adjusted by turning a screw at the rear of each measuring pin. A small conical-headed screw is used to lock the pin in place. The tool is ordinarily made in twenty-four sizes to fit work up to 12 in. in thickness.

Attachment, Grinding, Automotive-Piston, No. 509

Norton Company, Worcester, Mass.

"American Machinist," Oct. 6, 1921

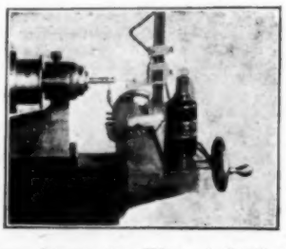


This piston-grinding attachment is for use on the autopart regrinding machine made by this concern. The attachment can be adapted to the holding of all styles and sizes of automotive pistons from 2¾ to 7½ in. in diameter. The fixture consists of a dead center, upon which revolves a cast-iron cone carrying thre tool-steel slidable jaws, the outer surfaces of which are ground conically. A transverse groove in each jaw permits the corner of the abrasive wheel to travel beyond the end of the piston. The cast-iron cone is driven by the regular drive pin and the piston itself by means of a spline on the side of one of the jaws.

Locating Device, "Electrocator," Hansen

Bely Sales Co., 601 Washington St., Lynn, Mass.

"American Machinist," Oct. 6, 1921



The device is intended to facilitate the exact location of a given point with reference to the center line of the revolving spindle of the machine doing the work. It consists of a small electric transformer, an electric lamp, and a "ball wiggler." The wiggler, one end of which is insulated electrically from the other, is placed in a collet or attached to the spindle of the machine. Upon starting the spindle, the ball will describe a circle. It causes the lamp to flash at each revolution. As the table is raised, the center of rotation of the spindle is finally reached by the ball and the lamp burns steadily. A further raising of the table causes the ball to roll off the gage.

Clip, paste on 3 x 5-in. cards and file as desired

directors are William H. Milne and George C. Ratchford of Schenectady; J. Edward Lurie of Albany.

The Southern Pacific Co. reports a net operating income for the seven months amounting to $20,931,851 as against $16,812,873 a year ago.

The Shamboro Shuttle Co., Woonsocket, R. I. has purchased at public auction the property of the Saluda Manufacturing Co., near Greenville, S. C., and will install new machinery preparatory to commencing manufacturing operations within the next ninety days.

The Nashville, Chattanooga and St. Louis Railway Co. has made application to the Interstate Commerce Commission to issue $1,800,000 of certificates, the proceeds from the sale to be applied on the cost of eight locomotives, nine baggage cars, six coaches and 1,000 freight cars, estimated at $2,297,037.

The Cemele Machine Co., Salem, Ohio, was incorporated recently at Columbus with a capital of $30,000. The incorporators are C. P. Hepler, Amos Entricken, Hiram S. Hendrick, Fred Kremser and John Leeson.

The Gifford-Wood Co., Hudson, N. Y., manufacturers of coal handling and conveying machinery, according to an announcement by the Pittsburgh Chamber of Commerce has secured the property at Hulton, Pa., formerly occupied by the Crescent Forging Co. and will begin the work of remodeling the property at once preparatory to the commencement of manufacturing operations.

The Rebstock Co., St. Louis, Mo., has been incorporated and will manufacture and deal in machinery of all kinds including iron, steel, wood and sheet metal and will do a general manufacturing business in these lines.

The Birmingham Stove Works, Birmingham, Ala., B. H. HARTSFIELD, manager, advises that several thousand dollars will be invested enlarging the plant.

The Norwalk Iron Works Co., South Norwalk, Conn., announces that it has with it the Automatic Carbonic Machine Co., of Peoria, Ill., the plant and equipment of which is being moved to South Norwalk. Arrangements are now being made whereby the Norwalk Iron Works will be in position to supply a completely developed line of carbonic gas equipment for refrigeration and ice making in addition to its standard ammonia equipment.

The Dawson Variety Works, Dawson, Ga., announces its intention to start work immediately on the reconstruction of its machine shops, recently destroyed by fire.

The Walworth Realty Co., a subsidiary of the Walworth Manufacturing Co., Boston, manufacturers of the Stillson wrench, the Walmanco joint and other steam and gas fittings, tubes, etc., have awarded Dwight P. Robinson and Co., Inc., the contract for the design and construction of a warehouse, pipe shop and garage to be located on Jackson Avenue, Long Island City. The scope of the work includes the design and construction of a 3-story and basement concrete building designed to permit the addition of three floors later on, a garage to accommodate eight trucks, a pipe storage building and a pipe shop extension at the rear of the main building; also necessary retaining walls, platforms, paving and railroad siding. The main building will contain the offices, city sales department, shipping room and space for the storage of fittings and material. The pipe storage building is to be 60 x 214 ft. and will be served by a crane running out over the railroad siding. Construction has already begun.

The Carlson Brothers Tool and Machine Co., South Boston, Mass., is reported recently to have taken a long lease on the machine shop at 15 B St., that city.

The St. Croix Paper Co., Woodland Junction, Me., suffered a loss in its new lumber plant of $150,000 by fire a few weeks ago, much new machinery being destroyed.

The Butterfield and Co. Division, Union Twist Drill Co., Derby Line, Vt., manufacturer of taps, dies, reamers and screw plates, are occupying their new brick and concrete fire-proof buildings recently completed. The main factory building is 170 ft. long by 70 ft. wide, three stories and a basement, with annex one-story high, 170 ft. by 60 ft. and basement, and an ell to the main building 85 ft. by 70 ft., three stories, all of the latest approved construction. This move has necessitated the purchase of considerable new equipment and machinery, and when completed gives them practically double their previous capacity, this being necessary to take care of their rapidly growing business.

The New York Air Brake Co., according to a statement just made public by B. J. Minnier, general manager, has unfilled orders on its books at the present time, the volume of which is greater than in any previous period in the company's history. June shipments totaled $700,000.

The Pierce Arrow Motor Car Co. reports August sales and shipments for this year as being greater than those for the corresponding month in any year in the company's history.

The Florida East Coast Railway Co. has asked the Interstate Commerce Commission for permission to extend its line a distance of 125 miles, from Okeechobee to Miami, Fla.

The Diamond Chain and Manufacturing Co. announces the opening of an office at 340 Leader-News Building, Cleveland, Ohio. The office will be in charge of MR. H. I. MARKEY, who has been with the company five years as mechanical engineer in its engineering and sales departments.

The Youngstown Sheet and Tube Co. directors have declared a quarterly dividend of 75 cents per share on the common stock payable Oct. 1 to stockholders of record Sept. 20. The previous dividend rate has been 50 cents per share quarterly.

The United Brass Manufacturing Co., 3844 Hamilton Ave., Cleveland, Ohio, a co-partnership consisting of Benjamin F. Klein and William J. Schoenberger, has been dissolved by mutual consent. The United Brass Manufacturing Co. continues as heretofore in the manufacture of plumbing brass goods and water works brass goods at its present location, under the sole ownership of Benjamin F. Klein. William J. Schoenberger withdraws, and takes over the gas valve and stove cock department, which will be operated by The W. J. Schoenberger Co., located at Harvard Ave. at 103d St., Cleveland, Ohio, manufacturing brass gas valves, gas cocks and special fittings for gas appliances.

The Oilgear Co., Milwaukee, Wis., announces the appointment of the Cadillac Machinery Co., Lafayette and Beaubien Sts., Detroit, as its representative in the sale and distribution of Oilgear products in the state of Michigan.

The Modern Truck Manufacturing Co., recently formed in Mobile, Ala., with a capital of $50,000, G. M. BRYDE of Mobile, president, announces that machine shops for turning out truck parts will shortly be established in that city.

The Berger Manufacturing Co., Canton, Ohio, was incorporated recently, in Illinois, according to dispatches from Springfield, with a capital of $100,000. EDWARD A. LANGENBACH was named as president and CHARLES W. KRIEG as secretary.

The Oilgear Co., Milwaukee, Wis., has opened a New York office at 39 Cortlandt St., in order to be in direct touch with the entire eastern territory. Russell, Holbrook and Henderson, 30 Church St., New York have been appointed sales representatives of this company for the district in and near New York City.

The Lees Bradner Co., Cleveland, Ohio, has opened a sales office at 32 North Clinton St., Chicago, with FRANK ARTZ in charge.

The Fremont Metal Co., Fremont, Ohio, was chartered this week with a capital stock of $50,000. The incorporators are Frank Nagle, Lawrence Freehs, Carl D. Perkins, Marshal Bixler, and Elizabeth Bixler all of Fremont. The company has for some time been making metal bodies for auto trucks.

The Sullivan Machinery Co., following the completion of its new plant at Michigan City, Ind., will remove its Chicago works, utilizing the equipment and later disposing of its buildings. A tract of 125 acres has been acquired for the new plant, buildings to include foundry, machine shop, assembling plant, etc., and estimated to cost about $1,000,000. Office headquarters will be maintained in Chicago as heretofore. The new plant is expected to be completed early next year.

Personals

J. D. POWELL, formerly connected with the L. S. Starrett Co. has become associated with the Lufkin Rule Co., and will make his headquarters at Saginaw, Mich.

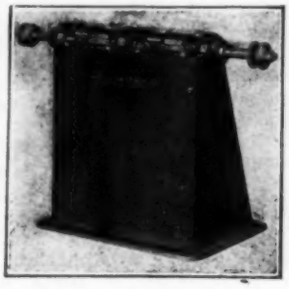
F. C. SCHREIBER, of late connected with the sales department of the Packard Co., has returned to the position which he formerly held with Stocker-Rumley-Wachs Co., Chicago, Ill.

IRVING S. KEMP has resigned his position as sales manager of the Vaughn &

Condensed-Clipping Index of Equipment

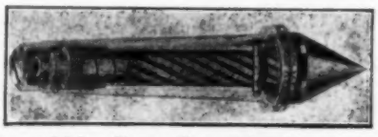
Patented Aug. 20, 1918

Lathes, Buffing and Polishing, Ball Bearing, Nos. 5 and 6
Mitchell Engineering Co., Springfield, Ohio
"American Machinist," July 20, 1922



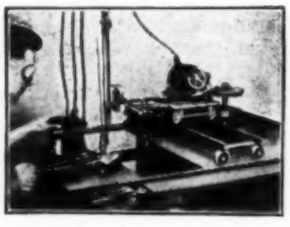
The No. 5 machine has two independent spindles, while the No. 6 model has a single spindle for carrying wheels at both ends. Its spindles can be controlled independently, and together with the bearings, can be removed by releasing the bearing-housing clamps. It can be furnished with motor drive and both machines can be driven either from overhead or underneath. No. 5 machine: Spindle length, 32 in.; spindle diameter in bearings, 2 in.; height to spindle center, 38 in.; floor base, 26 x 42 in.; net weight, 950 lb. No. 6 machine: spindle length, 48 in.; spindle diameter, 2 in.; height from floor to spindle center, 38 in.; floor base, 20 x 26 in.; net weight, 600 pounds.

Center, Anti-Expansion, Automatic
Snellex Manufacturing Co., Rochester, N. Y.
"American Machinist," July 20, 1922



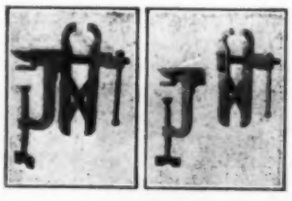
The center is used in lathe and grinding machine headstocks. The shank of the center proper is milled with a series of helical oil grooves and has longitudinal motion within the tapered case. This motion is opposed by a very stiff adjustable spring which allows the center to recede within the case to a limited extent when under great pressure, due to expansion of the work. Lubricant can be applied through a hole in the adjusting screw. Centers with Morse tapers from Nos. 1 to 6 are regularly carried in stock, but special tapers and centers can be furnished. Centers for grinding machines have heads of reduced diameter.

Welding Machine, Automatic, "GEWE"
General Welding and Equipment Co., Boston, Mass.
"American Machinist," July 20, 1922



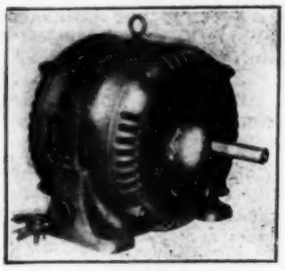
The welding rod passes through the center of the oxy-acetylene torch, and is fed downward by gravity. The torch is mounted on a connecting rod from which it receives a rotary motion. Motion at right-angles to the mean of that imparted to the connecting rod may be given to the whole machine, and the combined motion may be used in welding a seam. For heavy welds, an additional torch is supplied to preheat the metal. A friction wheel and disk, and a rheostat controlling the motor, give two speed adjustments. With the latter, finer adjustments and variations of speed can be made where the thickness of the metal varies.

Vise, Combined Hand and Bench
Malleable Iron Fittings Co., Branford, Conn.
"American Machinist," July 20, 1922



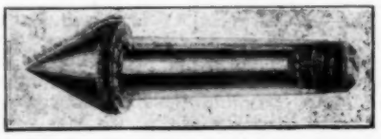
The vise is for the use of toolmakers and patternmakers in manipulating small pieces of work in filing and other operations. The anvil clamp is attached to the edge of the work bench and has a tapered dovetail slot into which the vise proper is fitted. The pantograph arrangement holds the jaws parallel at any amount of opening within its range. The vise has a sliding pin handle similar to the handle of a regular bench vise, and the offset nut allows the pin to be moved from end to end without interfering with the projecting screw. Either plain or serrated jaws are furnished. Capacity, 1½ x 1½ inches.

Motors, Electric, Multi-Speed, A.C., Watson
Louis Allis Co., Milwaukee, Wis.
formerly Mechanical Appliance Co., Milwaukee, Wis.
"American Machinist," July 20, 1922



Motors can be furnished for constant horsepower, constant torque or any required combination of both in two, three or four speeds. The speeds are 600, 720, 990, 1,200 and 1,800 r.p.m., for circuits of either 60 cycles or other frequencies, and of either two or three phase. A control apparatus can be supplied which is suitable for both automatic and remote control.

Center, Anti-Friction, Automatic
Snellex Manufacturing Co., Rochester, N. Y.
"American Machinist," July 20, 1922

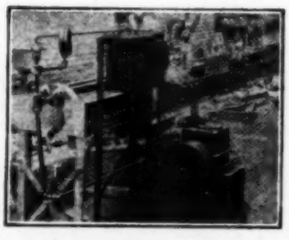


The anti-friction center is used in lathe and grinding machine tailstocks either in conjunction with or separately from the anti-expansion center. The balls in the front race are larger than those in the former model. Centers with Morse tapers from Nos. 1 to 6 are regularly carried in stock, but special tapers and centers can be furnished. Centers for grinding machines have heads of reduced diameter, so that the wheel can pass over them in grinding small work.

Micrometer, Inside, Height Gage
Reed Small Tool Works, Worcester, Mass.
"American Machinist," July 20, 1922

The micrometer range is lower than that of the other models and covers from 2 to 7 in. with the use of five rods. Five additional rods can be furnished for increasing the range to 32 in. The micrometer graduations read to 0.001 in. Converted into a height gage, the micrometer gives a range of 3 to 32 in. A clamping knurled nut holds the measuring rod in a perpendicular position. The V-shaped groove in the bottom of the base adapts the tool to measuring cylindrical work and distances between shafts. With a drill rod and a standard indicator, the tool can be used as a surface gage.

Press, Horizontal, Hydraulic
Oilgear Co., 60 Twenty-seventh St., Milwaukee, Wis.
"American Machinist," July 20, 1922



Ram speeds can be instantly changed by the operation of a control handle located on top of the pump. The pump is driven by a constant-speed, 2-hp. electric motor and no accumulator or auxiliary pump is required. Suitable overload relief valves prevent injury in case the ram is driven against a stop. The cylinder is 9 in. in diameter and the full capacity pressure exerted on the ram piston is 800 lb. per square inch. The diameter of the ram is 5¼ in. and the length of the stroke is 30 in. Forcing capacity: 25 tons at speeds of from ¼ to 6 in. per min. Maximum ram traversing speed: outward stroke, 37 in. per min.; return stroke, 56 in. per min. Distance between stop supports, 24 inches.

Clip, paste on 3 x 5-in. cards and file as desired

Bushnell Manufacturing Co., to become vice-president of the Evansville Tool Works, Evansville, Ind.

ALFRED J. LEWIS, formerly connected with the Babcock & Wilcox Co. and the American Steel Foundries Co., was recently appointed district representative with headquarters in the Foutain Building, Cleveland, Ohio, for the Pittsburgh Grinding Wheel Co., Rochester, Pa., manufacturer of grinding wheels and emery.

H. J. SWANSON, formerly associated with the Detroit Machine Tool Co. as sales manager, has been appointed manager of the Peerless Machine Co., Racine, Wis.

F. A. BALL, for many years associated with the L. S. Starrett Co., Athol, Mass., and more recently vice-president of the company, has been elected to the presidency to succeed the late L. S. Starrett.

JOHN J. CURRY, of Hartford, Conn., has recently been appointed mechanical superintendent of Plant D, of the New Departure Manufacturing Co., of Bristol, Conn., at Meriden, Conn. Mr. Curry has been in the Hartford plant of the company for some time, and is a master designer of tools, gages and fixtures used in the manufacture of the concern's products.

HARRY J. FOSS has been elected president of the Berkshire Mill Supply Co., of Pittsfield, Mass., to fill the vacancy caused by the recent death of CHARLES E. HIBBARD.

COL. C. L'H. RUGGLES, after a year spent as a student at the Army War College, has been returned to his old assignment as chief of the technical staff of the Ordnance Division of the War Department.

COL. J. W. JOYES, who has been serving as chief of the technical staff during the absence of Col. C. L'H. Ruggles, has been assigned to duty as ordnance officer for the Corps Area, having its headquarters at Governor's Island. Col. Samuel Hof, has resumed his regular duties as chief of the artillery division of the technical staff.

MILES W. O'BRIEN, president of the South Bend Lathe Works, South Bend, Ind., has been named a member of the board of lay trustees of Notre Dame University. He is the second South Bend man to be placed on the board, A. R. ERSKINE, president of the Studebaker Corporation, being the other.

W. G. NIMS has been elected vice-president of the L. S. Starrett Co., filling the vacancy created by F. A. Ball, who has just been elected president.

J. ERNEST G. YALDEN, for many years superintendent of the Baron de Hirsch Trade School, New York City, has resigned owing to poor health. ROBERT H. GREENE, who has been connected with the institution for several years, has been appointed to fill the vacancy.

FRED W. RAMSEY, who resigned as president of the Cleveland Metal Products Co., Cleveland, Ohio, some time ago to devote his attention to other activities, has been elected chairman of the board of the Cleveland Tractor Co. ROLLIN H. WHITE continues as president of the Tractor organization.

Obituary

CHARLES MILLER, a mechanical engineer in the employ of the New York Transit Commission, died in the Jewish Hospital, New York City, September 7, aged 58 years. He lived at 1,238 Bedford Avenue, Brooklyn, and was a member of the American Association of Engineers.

JOHN T. MCHUGH, 65, one of the leading steel men of the Shanango Valley, died September 9, following a short illness. Mr. McHugh was assistant superintendent of the Farrell plant of the American Steel and Wire Co. for the past several years, a member of the board of directors of the People's Bank and a former city councilman. In 1890 he worked in the same mill at Salem, O., where James A. Farrell, now president of the United States Steel Corporation, was a wire puller. He had been connected with the United States Steel Corporation for the past 35 years.

ALBERT PRYIBIL, president of the P. Pryibil Machine Co., Inc., New York City, manufacturer of spinning lathes, died at his home in that city, September 14, at the age of 51 years. Mr. Pryibil had been associated with the company for 35 years and had been president for the past twenty-five years. A widow and son, P. L. Pryibil, survive.

Book Reviews

Industrial Physics Mechanics. By L. Raymond Smith. Cloth; two hundred and eighteen, 5¼ x 8 in. pages. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York, N. Y. Price $1.75.

This, the first of a series of three books on industrial physics, thoroughly covers every detail of mechanics. The author states his subject in a way the student can understand and illustrates the theories in terms of the student's every day interests. The book is a text on elementary practical mechanics for technical, industrial, vocational and evening schools. Many questions and problems are given at the end of each chapter.

The subjects taken up deal with: measurement and measuring instruments, elementary trigonometry, gravitation and gravity, forces, motion, composition of forces and velocities, resolution of forces and velocities, equilibrium of concurrent forces, equilibrium of parallel forces, equilibrium of non-concurrent forces, commercial and laboratory structures, elasticity, work, power, energy, friction, simple machines, practical study of machines, mechanical transmission of power, fluids, falling bodies; centrifugal force; the pendulum.

The author holds the position of Instructor in Industrial Physics at the Wm. L. Dickinson High School, Jersey City, N. J., and has tried out the material in his classes.

Knots, Splices and Rope Work, by A. Hyatt Verrill. The Norman W. Henley Publishing Co., 2 West 45th St., New York. Pocket size, bound in cloth, 104, 4½ x 6¼ pages, 156 illustrations. Price, $1.

This little volume contains full directions for making most of the knots, splices, hitches and bends in use by seafaring men and riggers. It gives directions for making many of the ornamental knots used by those who "went down to the sea in ships" in the days when sailors were indeed sailors. The illustrations are vivid and the directions so complete as to be easily understood by the landlubber.

Everyone should know something of knots. As the author points out in his introduction, "a little knowledge of knots has saved many a life in storm and wreck and if everyone knew how to tie a knot quickly and securely, there would be fewer casualties in hotel and other fires.

Liquid Fuel. By Wm. H. Booth, Second Edition. Published by E. P. Dutton and Company, New York. Cloth, 6 x 9, 297 pages; 85 illustrations; 29 tables. Price $4.

A volume which contains much of the information included in the authors more elaborate work, LIQUID FUEL AND ITS COMBUSTION, issued in 1903, together with some more recent data on the burning of pertoleum fuel. The author deals, in the main, with English stationary and marine practice. He ignores the more advanced methods of burning oil as followed in America.

This would seem most unfortunate as the largest consumer of boiler oil is the United States and it is here that there is the greatest need of a thoroughly practical treasise on the subject as applying to American conditions. If the engineer wishes to obtain a general idea of the producton of crude oil, its chemical constitution and efficiency, as well as the precautions to be followed in burning oil, this volume will be found most desirable.

Pamphlets Received

Foreign Commerce Handbook. The Foreign Commerce Department, U. S. Chamber of Commerce, Washington, D. C. An exceptionally usable Foreign Commerce Handbook has just been issued by the Foreign Commerce Department of the Chamber of Commerce of the United States. Within the space of 31 pages this publication condenses a great deal of information as to sources of service in foreign trade. Its alphabetical arrangement makes it a handy reference work for the busy exporter or importer. The book contains also a list of the topics of national importance that are engaging the attention of the National Chamber's Foreign Commerce Department Committee under the chairmanship of Willis H. Booth of New York. As the first publication of its kind the handbook meets a distinct need in foreign trade circles.

Forthcoming Meetings

National Association of Cost Accountants. Third international conference to be held at Atlantic City, N. J. Sept. 23-28. Stuart McLeod, 130 West Forty-second St., New York, is secretary.

American Institute of Mining and Metallurgical Engineers, annual convention, Sept. 25 to 28, 1922, San Francisco, Cal. Secretary, F. F. Sharpless, 29 West 39th Street, New York City.

American Society of Mechanical Engineers, regional meeting, Sept. 25, 26 and 27, 1922, Hotel Kimball, Springfield, Mass. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

American Society for Steel Treating. Exposition and convention at the General Motors Co. building, Detroit, Oct. 2 to 7. W. H. Eisenman, 4600 Prospect Ave., Cleveland, is secretary.

Second National Aero Congress and National Airplane Races, Detroit, Mich., October 7 to 14, 1922.

American Gear Manufacturers' Association. Fall meeting, Chicago, Ill., Oct. 9, 10 and 11, 1922.

Society of Industrial Engineers. Oct. 18 to 20. McAlpin Hotel, New York. Secretary, George C. Dent, 327 South LaSalle St., Chicago.

American Manufacturers Export Association, annual convention, New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

American Trade Association Executives. Third annual meeting, Oct. 25, 26 and 27, 1922, at the Inn, Bucks Falls, Pa. (Delaware Water Gap).

National Founders Association, Nov. 22 and 23. Secretary, J M. Taylor, 29 South La Salle St., Chicago, Ill.

American Society of Mechanical Engineers, annual convention, December 4 to 7, 1922, New York City. Secretary, Calvin W. Rice, 29 West 39th Street, New York City.

National Exposition of Power and Mechanical Engineering. Dec. 7 to 13, 1922. Grand Central Palace, New York City. Secretary, Calwin W. Rice, 29 West 39th Street, New York City.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Pig iron still scarce; No. 2 foundry, up 50c. in Birmingham, $1 in Philadelphia, $2 in Chicago and $3 in New York; basic advanced $2 in Philadelphia and $2.50 in Pittsburgh; bessemer, $1 higher per gross ton, in Pittsburgh. Structural shapes and soft steel bars, $2@$2.10 per 100 lb., f.o.b. Pittsburgh on ordinary business; $2.15@$2.25 for prompt shipments. Revival of buying by railroads, stimulating demand for plates; oil tank and ship plate buying also active. Leading interest quotes $2 on tank plates; independents, $2.10@$2.50 per 100 lb. Mill price of tin plates unchanged; steel rails, however, up $3 per ton, effective Oct. 1, the first change on rails in a year. Blue annealed steel sheets, in New York warehouses, up 16c.; black and galvanized, 30c. per 100 lb. New York also quotes advances of 15c. on hoops, 25c. on strips and cold-finished steel and 30c. on floor plates.

Zinc, 7¼c. as against 7c.; Chinese antimony 7c. as compared with 5¾c.@6c. per lb., in New York warehouses. Lead demand active but prices stable; copper and tin also unchanged. Old metals, non-ferrous, up ¼c.@½c. per lb. in Cleveland.

Declines—Connellsville coke down 50c. per ton, prompt furnace and foundry; supply somewhat improved.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$29.55
Northern Basic	32.27
Southern Ohio No. 2	34.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	36.27
BIRMINGHAM	
No. 2 Foundry	27.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	34.64@35.64
Virginia No. 2	37.17
Basic	34.00
Grey Forge	33.00
CHICAGO	
No. 2 Foundry local	32.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	32.00
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	35.00
Basic	32.50
Bessemer	33.00

IRON MACHINERY CASTINGS—In cents per pound:

	Light	Medium	Heavy
Cincinnati	15.0	10.0	4.75
Detroit	10@12	8.0	3@4
New York	9@10	6.0	4.0
Cleveland	8.0	5.25	4.5
Chicago	5.0	4.5	3.5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50@2.60	4.19	3.50	4.00
No. 12	2.60@2.70	4.24	3.55	4.05
No. 14	2.70@2.80	4.29	3.60	4.10
No. 16	2.90@3.10	4.39	3.70	4.20
Black				
Nos. 17 and 21	3.20@3.35	4.70	4.05	4.70
Nos. 22 and 24	3.25@3.40	4.75	4.10	4.70
Nos. 25 and 26	3.30@3.45	4.80	4.15	4.75
No. 28	3.35@3.50	4.90	4.25	4.85
Galvanized				
Nos. 10 and 11	3.35@3.50	4.90	4.25	4.85
Nos. 12 and 14	3.45@3.60	5.00	4.35	4.95
Nos. 17 and 21	3.75@3.90	5.30	4.65	....
Nos. 22 and 24	3.90@4.05	5.45	4.80	5.40
No. 26	5.05@4.20	5.60	4.95	5.55
No. 28	4.35@4.50	5.90	5.25	5.95

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv
1 to 3	68	56½	¾ to 1½	39½	24½
LAP WELD					
2	61	49½	2	34½	20½
2½ to 6	65	53½	2½ to 4	37½	24½
7 to 8	62	49½	4½ to 6	37½	24½
9 to 12	61	48½	7 to 12	35½	22½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	66	55½	¾ to 1½	39½	25½
2 to 3	67	56½			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	59	48½	2	35½	22½
2½ to 4	63	52½	2½ to 4	38½	26½
4½ to 6	62	51½	4½ to 6	37½	25½
7 to 8	58	45½	7 to 8	30½	18½
9 to 12	52	39½	9 to 12	25½	13½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	47%	57½%	45½%	62½%	48½%
2½ to 6 in. steel lap welded	57%	44%	55½%	42½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.29	3.50	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.06	5.50
Cold finished shafting or screw	3.90	3.60	3.70
Cold finished flats, squares	4.40	4.10	4.20
Structural shapes (base)	3.04	2.91	2.90
Soft steel bars (base)	2.94	2.81	2.80
Soft steel bar shapes (base)	2.94	2.81	2.80
Soft steel bands (base)	3.74	3.61	3.55
Tank plates (base)	3.04	2.91	2.90
Bar iron (2.45 at mill)	2.94	2.81	2.80
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
⅜	8.00		12@13
⅛	6.50		11@12
5/32 to ¼	6.25		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	14.62½
Tin, 5-ton lots, New York	32.50
Lead (up to carlots), St. Louis 5.80; New York	6.60
Zinc (up to carlots), St. Louis 6.50@6.55; New York	7.12½

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	19.20	20.00	20.00
Antimony (Chinese), ton spot	7.00	7.75	8.00
Copper sheets, base	21.50	22.00	23.00
Copper wire (carlots)	15.75	18.00	16.25
Copper bars (ton lots)	20.00	23.00	19.50
Copper tubing (100-lb. lots)	24.75	25.00	23.00
Brass sheets (100-lb. lots)	18.25	29.50	18.75
Brass tubing (100-lb. lots)	22.50	23.50	20.50

—Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	16.75	18.50	15.75
Brass wire (carlots)	18.75	19.50	.....
Zinc sheets (casks)	9.25	9.25	.....
Solder (½ and ½), (caselots)	25.00	23.50	20.00
Babbitt metal (fair grade)	25.00	42.25	36.00
Babbitt metal (commercial)	15.00	16.00	9.00
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	12.25	12.00
Copper, heavy, and wire	11.75	11.75	11.50
Copper, light, and bottoms	9.75	10.00	10.50
Lead, heavy	4.75	4.50	4.75
Lead, tea	4.25	3.50	4.00
Brass, heavy	7.00	6.00	9.25
Brass, light	6.00	5.00	6.00
No. 1 yellow brass turnings	6.50	6.50	7.00
Zinc	3.00	3.50	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:			
IC, 20x28, 112 sheets	20.00	18.25	18.50
IX, 20x28, 112 sheets	23.00	21.00	20.90
"A" Charcoal Allaways Grade:			
IC, 20x28, 112 sheets	17.00	16.00	17.00
IX, 20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	12.50	11.00	14.50
IC, 112 sheets	12.80	11.40	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	5.80	7.25
IC, 14x20	7.25	6.05	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.09@$0.11½	$0.12	$0.11½
Cotton waste, mixed, per lb.	.065@.10	.09	.08
Wiping cloths, 13¼x13¼, per lb.	.075	.06	.10
Wiping cloths, 13¼x20½, per lb.	.08	.096	.13
Sal soda, 100 lb. lots	2.80	2.40	2.65
Roll sulphur, per 100 lb.	2.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.91	1.01	.97
White lead, dry or in oil	100 lb. kegs.	New York, 12.50	
Red lead, dry	100 lb. kegs.	New York, 12.50	
Red lead, in oil	100 lb. kegs.	New York, 14.00	
Fire clay, per 100 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per net ton	11.00@11.50	
Coke, prompt foundry, Connellsville	per net ton	12.50@13.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	45%	60%	50-10%
1½ and 1¼x3 in. up to 12 in.	25%	50%	50-10-10%
With cold punched sq. nuts	30%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	35%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	20%	3.90 net	.....
Hex. head and hex. nut bolts	25%	.....	65-5%
Lag screws, coach screws	45%	.....	60-5%
Square and hex. head cap screws	75%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	35%	50-10-5%	50-5%
Bolt ends, with hot pressed nuts	45%	.....	55%
Tap bolts, hex. head, list plus	10%	.....	.....
Semi-finished nuts ⅝ and larger	65%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$5.00	$3.50	$3.50
Washers, cast iron, ⅜ in. per 100 lb. (net)	4.00	3.25	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.50	3.50	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.50	3.50	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	3.50	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	3.50	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	55%	60%	60%
Rivets, tinned	55%	60%	4½c. net
Button heads ¾-in., ⅝-in., 1x2 in. to 5 in., per 100 lb. (net)	$4.50	$3.50	$3.35
Cone heads, ditto (net)	4.60	3.60	3.45
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50-%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	40-5%	40½%	50%
Heavy grade	30-5%	30-5%	40-5%
Rubber and duck:			
First grade	60-5%	50-10%	40-10%
Second grade	60-10-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll,	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	1.32	1 24	1.40
Cloth	3.02	2 67	3 20

New and Enlarged Shops

Machine Tools Wanted

Calif., Los Angeles—J. Slater, 2826 South Hope St.—9 in. swing screw cutting machine, 3 ft. between centers, for machine shop.

Ill., Chicago—Emil J. Paidar Co., 1214 North Wells St., barber supplies, E. J. Paidar, Purch. Agt.—horizontal boring mill.

Ky., Louisville—Greathouse Bros., 654 South 9th St.—power punch and shears for machine shop.

Md., Baltimore—A. Weiskittel & Son Co., 12th St.—one 60 in. x 60 in. x 12 ft. planer and 2 heavy engine lathes.

Mass., Jamaica Plain (Boston P. O.)—C. Carlson, 8 Boylston Pl.—small tools, drills and equipment for garage and machine shop.

Mich., Detroit—E. Gray, foot of Continental Ave.—machine shop equipment for proposed automobile service station.

Mich., Saganaw—A. F. Bartlett & Co., 930 South Tilden St., A. M. Lemke, Pres.—one 16 in. or 18 in. heavy duty engine lathe with 10 ft. or 12 ft. bed, new or slightly used.

Mo., Kansas City—C. W. Berlett, 5729 Charlotte St.—power lathe and drill press for machine shop.

N. Y., Binghamton—Ornamental Iron & Welding Wks., A. Reynolds, Purch. Agt.—one shear, Henry Pels & Co., No. 13.

N. Y., Buffalo—I. Adler, 27 Walnut St.—machinery and equipment for garage and service station.

N. Y., Buffalo—R. H. Best, 236 Connecticut St.—equipment for garage and service station.

N. Y., Buffalo—Bronze Hardware Mfg. Corp., c/o W. H. Barlow, Pres., 108 College St.—machinery and equipment for the manufacture of automobile hardware and specialties.

N. Y., Buffalo—Earl Kinner, Inc., 91 Calvin St., A. G. Maddigan, Treas.—1,000 gal. gasoline tank with pump, and other equipment, for proposed gasoline and service station.

N. Y., Buffalo—A. J. Missert, 1477 Main St.—two 1,000 gal. tanks, two 5 gal. gasoline pumps and other equipment for gasoline and service station.

N. Y., Buffalo—J. Sattler, 1546 Delaware Ave.—machinery and equipment for proposed garage and repair shop on Auburn Ave.

N. Y., Buffalo—E. Waechter, 100 Ontario St.—machinery and tools for proposed garage and repair shop.

N. Y., Rochester — Jensen-McCollum, Inc.—machinery and equipment for garage and service station.

O., Columbus—Bingham Mfg. Co., manufacturers of tractors and truck wheels, H. N. Bingham, Pres.—two lathes, broaching machines, two grinders and other machinery.

O., Ironton—Ironton Boiler Wks., 511 North 2nd St., P. Meehan, Pres.—metal working machinery of various kinds.

O., Paulding—Paulding Wire & Iron Wks. Co., J. A. Mohr, Purch. Agt.—manufacturer of wire and iron products—metal working machinery.

O., Sandusky—Farrell-Cheek Steel Fdry. Co., foot of 1st St.—one 50 ton power press.

Pa., Canton—Canton Auto Sales Co.—machinery and tools for proposed garage and repair shop.

Pa., Canton—Keystone Garage Co.—machinery and tools for garage and service station, now being remodeled and enlarged.

Pa., Phila.—Ludwig Bros., 3226 Lee St.—one 6 ft. radial drill press, one 24 in. heavy duty shaper, one 42 or 48 in. planer, 12 to 14 ft. bed.

Tenn., Nashville—Standard Machine Co., 311 5th Ave.—machine shop equipment.

Va., Richmond—Pressed Metal Wks., Inc.—square shears, plating machinery and punch presses.

W. Va., Logan—Guyan Machine Shops—slitting shear and punch for 1 in. plate, also one 150 to 200 ton wheel press.

Wis., Appleton—Herman Motor Car Co., 680 College Ave.—automobile repair machinery for garage.

Wis., Appleton—Valley Motor Car Co., 726 College Ave.—machinery for proposed automobile repair shop.

Wis., Ashland—C. Walkusch—automobile repair machinery for proposed garage.

Wis., Mattoon—The Kratz Motor Co.—machinery for automobile repairing.

Wis., Milton—Burdick Cabinet Co., manufacturer of bath room cabinets and electrical medical apparatus—machine tools for proposed factory.

Wis., Milwaukee—Lynx Mfg. Co., 564 East Water St. (manufacturer of automobile accessories), L. P. Falconer, Purch. Agt.—punch press.

Wis., Oshkosh—Hathaway Buick Co., 25 Church St.—chain hoist and drills for proposed machine and repair shop.

Wis., Racine—Wisconsin Incubator Co., 1331 18th St.—sheet metal working machinery.

Wis., Sparta—Gross-Overland Co., M. Gross, Mgr.—machinery for auto repairing.

Ont., Chippewa—Davidson & Williams—complete equipment for garage and auto repair shop at Niagara Falls.

Ont., Port Elgin—W. S. Fenton—one engine lathe, with 12 ft. bed, back geared and compound rest.

Australia, New South Wales, Sydney—Benson Bros.—2 machines for making ⅛ in. washers.

Machinery Wanted

Cal., Owensmouth—G. W. Hector, (blacksmith) — shearing machinery and tire shrinker.

Conn., Norwich—Adams & Manning, 20 Thames St.—machine for crocheting cord or yarn around small rings.

Fla., Brooksville — Hernando County Dairy Co.—ice making and refrigerating machinery for proposed $55,000 dairy.

Fla., Miami—Biscayne Yacht & Machine Wks.—machinery for repairing and building yachts and other light water crafts.

Ga., Rome—Battery Mchy. Co., A. Butler, Purch. Agt.—one 10 x 12 Ingersoll Rand belt driven compressor, 100 lb. pressure, and one 50 hp. 3 phase, 60 cycle, 220 volt motor, with enough speed to drive compressor.

Ill., Chicago—Bauer & Black, 2500 South Dearborn St. (job printers)—Universal printing press, 14 x 22, with rollers.

Ill., Chicago—G. Mayer, 4238 Grand Blvd.—one crane, complete with clamshell.

Ill., Galesburg—C. A. Hall, 113-117 South Cherry St., manufacturer of candy—motor and candy maker.

Ind., Boonville—Enquirer—6 point linotype mats, remelting furnace, motor, belting and hangers.

Ia., Dubuque—The City, c/o O. E. Carr, City Hall—two 1,750 cu.ft. air compressors.

Kan., Wellsville—The Globe (newspaper)—three 10 x 15 ft. job presses for power attachment, also other printing equipment.

La., Oakdale—Oakdale American—power press.

Mass., Allston (Boston P. O.)—Lincoln Laundry, 10 Wilton St., A. Lincoln, (owner)—machinery and equipment.

Mass., Brockton—Plymouth County Shoe Co., H. J. Feingold, Secy.—additional machinery for shoe plant.

Mass., Cambridge—Hingham Knitting Co., Charles River Parkway—"Banner" machine footers, 2 in. with 128 needles.

Mass., Haverhill—J. O. Ellison—air compressor with tank, drills, reamers and other small tools for garage, (used).

Mass., North Adams—Art Cloth Mills, Inc., H. D. Gagner, Pres.—several looms for small factory.

Mass., Waltham — Massasoit Knitting Co., Main St., T. E. Batey, Treas.—additional machinery for woolen mill.

Mich., Cadillac — Cadillac Lumber & Chemical Co., W. L. Saunders, Purch. Agt.—conveying and transfer machinery, power operated.

Mich., Detroit—Dodge Bros., 7900 Jos. Campau Ave.—complete equipment for proposed addition to automobile manufacturing plant.

Minn., Minneapolis—B. Walkup, 417 Hennepin Ave.—two linotypes.

Mo., Hartsburg—**The Truth**—newspaper press, paper cutter and other printing equipment.

N. Y., Buffalo—American Radiator Co., 693 Main St.—complete machinery and equipment for proposed $1,500,000 radiator factory at St. Paul, Minn.

N. Y., Buffalo—N. Bellanca, 350 Jefferson Ave.—shoe repairing machinery for proposed shop at 1389 Jefferson Ave.

N. Y., Buffalo—The Buffalo Bronze Die Casting Co., 90 Arthur St.—machinery and equipment for proposed addition.

N. Y., Buffalo—J. Economou, 2455 Seneca St.—machinery and equipment for proposed candy manufacturing plant.

N. Y., Buffalo—J. Mertz, 555 Sherman St.—equipment and tools for wagon repair shop at 12 Camp St.

N. Y., Buffalo—H. Mueller, Jr., 212 Forest Ave.—one cake machine, electrically driven, also other equipment for new bakery.

N. Y., Buffalo—Queen City House Wrecking Co., 68 Colorado St., W. G. Sweet, Dir.—machinery and equipment, electrically driven, for proposed saw mill.

N. Y., Buffalo—W. Sheehan, 52 East Utica St.—machinery and equipment for proposed broom factory.

N. Y., Buffalo—C. W. Siegel, 111 Eller Ave.—equipment for proposed bakery at 1175 Hertel Ave.

N. Y., Buffalo—Robertson-Cataract Electric Co., Mohawk and Elmwood Aves., manufacturer of switchboard equipment, J. D. Robertson, Pres.—machinery and equipment for proposed addition to factory.

N. Y., Canandaigua—Lisk Mfg. Co., 243 Gorham St.—machinery and equipment for enameling plant at Geneva.

N. Y., Cuba—Cuba Products Co., 26 West Main St., E. E. Moses, Dir.—machinery for food products plant.

N. Y., Gainesville—Gainesville Potato Assn., E. K. Lucas, Mgr.—machinery and equipment for handling and packing potatoes, for plant now under construction.

N. Y., New York—National Sponging Wks., 419 Lafayette St.—pile fabric brushing machine.

N. Y., New York—O. Sowers, 104 John St. (chemist)—machine for cutting small pinions.

N. Y., Orchard Park—Bd. Educ.—complete vocational equipment for high school, soon to be constructed.

N. Y., Rochester—Eastman Kodak Co.—machinery and equipment for proposed chemical factory in East Kodak Park.

N. Y., Rochester—I. Goldstein, 32 Oakman St.—several paper and lead cutting machines.

N. Y., Rochester—R. H. Gorsline, c/o New York State Sewer Pipe Supply Co., Union Trust Bldg.—special machinery and equipment for the manufacture of patented foto-tone, an apparatus for photographing sound waves.

N. Y., Tonawanda—King Electric Mfg. Co., 20 North Niagara St.—machinery and equipment for the manufacture of battery charging devices for automobiles.

N. C., Charlotte—Western Newspaper Union, 209 North Graham St.—ruling machine punch and perforator.

N. C., Hickory—Coast Line Overall Co. machinery and equipment for proposed branch factory at Monroe.

Okla., Dewar—United States Zinc Smelting Co.—new machinery and equipment for crushing and mixing departments, to replace that which was recently destroyed by fire.

Pa., Beaver Falls—Bd. Educ.—equipment for vocational department of new high school.

Pa., Canton—J. E. Roenitz—machinery, tools and equipment for plumbing shop now under construction, on Troy St.

Pa., Clarks Summit—Bd. Educ.—equipment for vocational department of proposed school.

Pa., Columbia—The Peerless Folding Box & Crate Co.—box and crate making machinery.

Pa., Lancaster—The Monitor Bi-Loop Radiator Co., Woolworth Bldg.—machinery and equipment for proposed addition.

Pa., Monaca—Bd. Educ.—equipment for manual training department of new high school.

Pa., Phila.—M. J. Hunts Sons Co., 251 Richmond St., (machinists) M. J. Hunt, Jr., Purch. Agt.—one complete cutting and welding outfit.

Pa., Phila.—D. I. Mann, Green St., contractor — portable log saw mill and engine.

Pa., Phila.—Robinson Iron & Steel Co., Parker & Umbria St.—stiff leg derrick, 40 ft. boom, about 3 ton capacity, complete.

Pa., Scranton—The Scranton Cap Co., 226 Penn Ave.—machinery and equipment for proposed addition to factory.

Pa., Scranton—Scranton Multigraphing Co., Rafter Bldg.—motor driven multigraphing machinery.

Pa., Wilkes-Barre—Lycoming Knitting Co., manufacturer of underwear and knit goods—machinery and equipment for branch factory at Dallas.

Pa., Williamsport—W. D. Crooks & Sons, Park St.—new machinery for proposed addition to factory for the manufacture of doors.

R. I., Providence—United Electric Ry. Co., Union Sta.—equipment for automobile repair shop.

S. C., Camden—Herfuth Engine & Mchy. Co.—one inclosed belt driven type ice making machine.

S. C., Florence—Florence Printing Co.—one power printing press.

Tenn., Copperhill—Copper City Printing Co.—one 9 x 12 job press for power equipment.

Tex., Austin—J. D. Miller—one 8 x 12 power job press, belting, hangers and supplies for job printing house.

Va., Ashland—Ashland Garage, V. Priddy, Purch. Agt.—burning in machine, battery torch, and oxygen air stand.

Va., Richmond—Eubank & Gaines, 1337 East Franklin St.—power cutting machine for printing plant.

Va., Richmond—Merchants Cold Storage & Ice Mfg. Co., 208 South 6th St.—compressors and one 120 ton ice making plant.

Va., Richmond—J. H. Rose Co., 16 North 13th St., (plumbing, roofing, cornice work)—10 ft. steel cornice brake.

Va., Richmond—Standard Electric Co., 1821 East Main St.—equipment for electrical repair and service works, (new).

Va., Richmond—Standard Printing Co., 1325 East Franklin St., A. L. Brockwell, Purch. Agt.—pony cylinder press.

Wis., Astico—Elba Condensing Co., J. W. Jones, Purch. Agt.—milk condensing machinery, power driven.

Wis., Athens—W. L. Erbach, woodworker—re-saw, motor driven.

Wis., Fredonia—Gilson Bros. Co.—equipment and motors for foundry.

Wis., Green Bay—Fairmont Creamery Co., 200 North Bway.—additional dairy machinery.

Wis., Jeffris—Larsen Lumber Co.—saw mill machinery, belting and shafting.

Wis., LaCrosse—J. F. and L. A. Keizer, 935 West Ave., S.—storage tanks, pumps, etc., for garage and filling station.

Wis., Milwaukee—Peerless Dye Wks., 3412 North Ave., F. W. Schmer, Purch. Agt.—dyeing and cleaning equipment.

Wis., Milwaukee—Rietbrock Land & Lumber Co., 700 Cedar St.—planer, rip saw, re-saw and cut-off saw, all equipped with individual motors, for proposed planing mill at Athens.

Wis., Sheboygan—Calumet Canning Co., c/o P. H. Peacock, 309 Michigan Ave.—machinery for pea and corn canning plant at Brillion.

Wis., Watertown—Perfection Table Slide Co., c/o W. C. Schultz, 603 Clyman St., manufacturers of tables and novelties—additional wood working machinery.

Wis., Wauwatosa—Milwaukee County Institutions, Bd. of Trustees, Watertown Plank Road, W. L. Coffey, Secy.—receiving bids until Sept. 25 for 2 automatic platform scales, 2 ton capacity.

Wis., West Bend—West Bend Construction Co., P. Berres, Purch. Agt.—sander (drum), planers, band saw and stickers.

Wis., Winneconne—Winneconne Co-operative Exchange, c/o J. Dreske—crushing, grinding, shelling and grain cleaning machinery for proposed grist mill.

Ont., New Toronto—Anaconda American Brass Co.—equipment for foundry at Port Credit.

Ont., Toronto—Glen Motors Ltd., Bank of Toronto Bldg.—machinery and equipment for proposed motor car plant to be erected along Niagara Frontier, possibly at Niagara Falls, Ont.

Que., Montreal—L. Bochom, 567 Delormier Ave.—anvil, forge and general equipment for blacksmith shop.

Que., Quebec—Price Bros. Co., 56 St. Pierre St.—machinery and equipment for the two proposed paper pulp mills at Kenogami.

Metal Working Shops

Calif., Atascadero—Doble Steam Motors Co., 714 Harrison St., San Francisco, will soon receive bids for the construction of a 1½ story, 100 x 500 ft. automobile factory, here. Estimated cost $100,000. Home Builders' Service Bureau (A. Roth), Atascadera, Archts.

Conn., Hartford—M. S. Little Mfg. Co., 151 Park Ave., manufacturer of plumbing goods, awarded the contract for the construction of a 1 story, 50 x 65 ft. addition to its factory. Estimated cost between $15,000 and $20,000.

Del., Wilmington—Hilles & Jones Co. awarded the contract for the construction of a 2 story, 88 x 240 ft. foundry on 9th and Church Sts. Estimated cost $50,000.

Ill., Chicago—S. M. Earling, 140 South Dearborn St., is having plans prepared for the construction of a 1 story, 90 x 160 ft. garage, Montrose and Greenview Sts. Estimated cost $50,000. T. R. Bishop, 35 South Dearborn St., Archt.

Ill., Waukegan—Hewes Garage, 334 North Genesee St., is having plans prepared for the construction of a 2 story, 50 x 66 ft. addition to its garage. Estimated cost $40,000. National Constr. Co., 490 Virginia St., Milwaukee, Wis., Engrs.

Ind., Indianapolis—Olin Sales Co., 509 North Meridian St., awarded the contract for the construction of a 3 story, 51½ x 195 ft. automobile sales and service station, at 720-2 North Meridian St. Estimated cost $150,000. Noted Sept. 7.

Mass., Everett—Boston Elevated Ry. Co., 108 Massachusetts Ave., Boston, awarded the contract for the construction of substructures and foundations for two 160 x 300 ft. and two 53 x 56 ft. car repair shops and an 80 x 731 ft. transfer shop, here. Estimated cost, complete, $3,000,000. Noted Aug. 29.

Mass., West Springfield (Springfield P. O.)—Wico Electric Co., 132 Liberty St., awarded the contract for the construction of a 1 story, 90 x 400 ft. factory on West Rd. Estimated cost $100,000. Private plans. Noted Aug. 29.

Mass., Worcester—The Norton Co., Barbers Crossing, manufacturer of grinding wheels, awarded the contract for the construction of a 4 story, 50 x 125 ft. factory. Estimated cost $75,000.

Mass., Worcester—Wickwire-Spencer Steel Corp., 80 Webster St., awarded the contract for the construction of a 3 story, 33 x 100 ft. factory. Estimated cost $45,000.

Mich., Detroit—Dodge Bros., 7900 Jos. Campau Ave., are having plans prepared for the construction of an 8 story, 160 x 460 ft. addition to their automobile factory. Estimated cost $1,500,000. Private plans.

Mich., Detroit—E. Gray, foot of Continental Ave., is receiving bids and will open same about Sept. 23 for the construction of a 1 story, 34 x 260 ft. automobile service station, on Continental Ave. Estimated cost $40,000. Private plans.

Mich., Flint—The Fisher Body Ohio Co., East 140th St., and Coit Rd., awarded the contract for the construction of a 2 story, 202 x 401 ft. factory, for the manufacture of automobile bodies. Estimated cost $500,000.

N. J., Trenton—Mercer County Freeholders will receive bids until Sept. 26 for the construction of a 2 story, 55 x 75 ft. garage and warehouse on Brunswick Ave. Estimated cost $40,000. Noted Aug. 29.

N. Y., Buffalo—The Buffalo Bronze Die Casting Co., 90 Arthur St., plans to build an addition to its factory. Estimated cost $5,000. Private plans.

N. Y., Buffalo—The Cleveland Cold Drawn Steel Co., has been re-organized under name of Buffalo Cold Drawn Steel Co., Inc., and has purchased a 5½ acre site here, and plans to construct a plant, 36,000 ton annual capacity. F. R. Kew, Dir. and Production Mgr.

N. Y., Buffalo—W. W. Grupp, 425 Humboldt Parkway, plans to build a 1 story garage, 50 ft. front, 64 ft. rear, 52 and 68 ft. sides, on Sycamore St. Cost will exceed $40,000.

N. Y., Buffalo—J. Sattler, 1546 Delaware Ave., plans to build a 50 x 272 ft. garage on Auburn Ave.

N. Y., Buffalo—E. Waechter, 100 Ontario St., plans to build a 2 story, 60 x 100 ft. garage on Ross Ave. and Ontario Sts. Cost to exceed $40,000.

N. Y., Hudson—The Holbrook Co., automobile body manufacturers, awarded the contract for the construction of a 100 x 260 ft. manufacturing building, also a 20 x 30 ft. service building, etc. Estimated cost $80,000.

N. Y., Long Island City—Walworth Realty Co., a subsidiary of Walworth Mfg. Co., 142 High St., Boston, manufacturer of Stillson wrenches, Walmanco joint and other steam and gas fittings, tubes, etc., awarded the contract for the construction of a 3 story, 76 x 182 ft. main building, a 1 story, 60 x 214 ft. storage building, a 1 story, 40 x 45 ft. garage and a 1 story, 45 x 116 ft. pipe shop, on Jackson Ave., here.

N. Y., Rochester—Jenson-MacCollum Co., 529 East Main St., awarded the contract for the construction of a 1 story, 100 x 155 ft. and 20 x 24 ft. auto sales building and service station, on Main St., E. Estimated cost $75,000.

O., Cleveland—F. Svoboda, 5377 Bway., is receiving bids and will open same about Sept. 22, for the construction of a 2 story, 45 x 139 ft. garage on Bway. and Mumford Sts. Estimated cost $60,000. Private plans.

Pa., Lancaster—The Monitor Bi-Loop Radiator Co., Woolworth Bldg., plans to build an addition to its factory, (25,000 sq.ft. floor space). Architect not announced.

Pa., Meadville—The Meadville Iron Co., Inc., Mill St., is receiving bids for the construction of a 1 story, 60 x 88 ft. factory addition, to be used as an annealing plant. O. Kohler, Pres., Shutts & Morrison, Marine Bank Bldg., Archts.

Pa., Monongahela—H. R. Downer and W. M. Rees, c/o Keystone Garage, are having plans prepared for the construction of a 2 story, 60 x 200 ft. garage. Estimated cost $40,000. Private plans.

Pa., Phila.—A. Box & Co., Inc., 813 North Front St., awarded the contract for the construction of a 1 story, 82 x 90 ft. and 30 x 110 ft. machine shop, on Ontario and Janney Sts. Estimated cost $6,000.

Pa., Pittsburgh—Graham Nut & Bolt Co., 1317 West Carson St., awarded the contract for the construction of a 1 story manufacturing building. Estimated cost $100,000.

R. I., Pawtucket—H. & B. American Machine Co. awarded the contract for the construction of an additional story to its 3 story plant. Estimated cost $100,000.

R. I., Providence—Hope St. Garage Co., Inc., 825 Hope St., plans to build a 1 story garage and service station on 4th St., capacity 100 cars. Estimated cost $50,000. Architect to be announced later.

R. I., Providence—United Electric Ry. Co., Union Sta., awarded the contract for the construction of a 1 and 2 story, 88 x 250 ft. garage and repair shop on Melrose and Russell Sts. Estimated cost $100,000. Noted Sept. 14.

Wis., Appleton—Valley Motor Car Co., 726 College Ave., awarded the contract for the construction of a 2 story, 50 x 60 ft. garage and repair shop.

Wis., Ashland—C. Walkusch is receiving bids for the construction of a 2 story, 50 x 95 ft. garage. Estimated cost $40,000. Private plans.

Wis., Fredonia—Gilson Bros. Co. awarded the contract for the construction of a 1 story, 40 x 110 ft. foundry. Estimated cost $25,000. Noted Aug. 10.

Wis., Jefferson—Probst Bros., c/o E. Probst, are preparing plans for the construction of a 1 story, 50 x 90 ft. garage. Estimated cost $40,000. Private plans.

Wis., La Crosse— J. F. and L. A. Keizer, 935 West Ave., plans to build a 1 story, 50 x 60 ft. garage and filling station. Estimated cost $40,000. Architect not selected.

Wis., Milton—Federal Eng. Co., 444 Milwaukee St., Milwaukee, is receiving bids for the construction of a 1 story, 80 x 160 ft. factory here, for the Burdick Cabinet Co., manufacturers of bath room cabinets and electrical medical apparatus. Estimated cost $45,000.

Wis., Neenah—Jaeger-Dowling Co., 214 South Commercial St., awarded the contract for the construction of a 2 story, 75 x 120 ft. garage and repair shop. Estimated cost $40,000. Noted Aug. 29.

Wis., Oshkosh—Hathaway Buick Co., 25 Church St., awarded the contract for the construction of a 1 story, 60 x 120 ft. machine and repair shop. Estimated cost $40,000.

Wis., Racine—W. J. Redden, Archt., 2819 Arlington Ave., is receiving bids and will open same about Sept. 25 for the construction of a 1 story, 38 x 46 ft. addition to sheet metal department of the Wisconsin Incubator Co., 1331 18th St. Estimated cost $15,000.

Wis., Sheboygan—Keil Oil Co., c/o W. G. Keil, 1516 North 9th St., awarded the contract for the construction of a 1 story, 40 x 90 ft. filling station and garage. Estimated cost $40,000. Noted July 6.

Wis., Sheboygan—Schneidewind & Zehm, 1401 Indiana Ave., plan to build a 2 story, 70 x 100 ft. garage and repair shop. Estimated cost $45,000. Architect not selected.

Ont., Georgetown—J. N. O'Neil & Son have had plans prepared for the construction of a 2 story garage, automobile repair shop and blacksmith shop. Estimated cost $50,000.

Ont., Niagara Falls—Davidson & Williams, Chippewa, plan to build garage and auto repair shop, here. Estimated cost $50,000.

Que., Montreal—Quebec Liquor Comrs., 34 St. Paul St., W., plan to build a 2 story garage on Delormier St. Estimated cost $53,000.

General Manufacturing

Calif., Berkeley—El Dorado Oil Co., University Ave. and 3rd St., awarded the contract for the construction of a 2 story addition to its factory. About $10,000.

Conn., Norwich—American Thermos Bottle Co., off Laurel Hill Ave., plans to build a large factory and warehouse.

Ill., Chicago—C. Hatzfeld, Archt., 7 South Dearborn St., is receiving bids for the construction of a 1 story, 47 x 105 ft. factory at 4317 Grand Ave., for the National Paint & Wall Paper Co., c/o architect. Estimated cost $20,000.

Mass., Fall River—Stevens Mfg. Co., Hartwell St., awarded the contract for the construction of four 1 story additions to its plant, for the manufacture of quilts, consisting of one 85 x 95 ft. addition to bleachery, one 45 x 55 ft. kierhouse, one 18 x 30 ft. caustic house and one 25 x 36 ft. filter house. Estimated cost $60,000.

Mo., Springfield—C. L. Rhodes Produce Co., 443 South Campbell St., will receive bids until Sept. 25, for the construction of a 2 story, 84 x 141 ft. plant. Estimated cost $50,000. Heckenlively & Mark, 642 Landers Bldg., Archts.

Mo., Springfield—Springfield Tannery Co., 214 Holland Bldg., is having plans prepared for the construction of a 1 story, 100 x 135 ft. factory, on Commercial St. Estimated cost $12,000. E. Hawkins & Co., 400 McDaniel Bldg., Archts.

N. H., Guild—Dorr Woolen Co. will build a 1 story, 45 x 50 ft. addition to its factory here.

N. J., Trenton—The Standard Inlaid Mfg. Co., East State St., manufacturer of linoleum, awarded the contract for the construction of a 2 story, 35 x 258 ft. factory. Estimated cost $50,000.

Every one of these items is reported by our authorized correspondents who are instructed to verify every item sent in. Everything possible is done to insure authenticity and timeliness. This free weekly service is published in the interests of the buyer and the seller, to bring them together and get machinery moving. Your co-operation is invited.

BUSINESS NEWS DEPARTMENT
Tenth Ave. at 36th St., New York

N. Y., Buffalo—Air Reduction Sales Co., 342 Madison Ave., New York, is having plans prepared for the construction of a plant here. Estimated cost $50,000. Francisco & Jacobus, 511 5th Ave., New York, Archts.

N. Y., Buffalo—W. Sheehan, 52 East Utica St., plans to build a 1 story, 32 x 42 ft. broom factory. Architect not announced.

N. Y., Geneva—Lisk Mfg. Co., 243 Gorham St., Canandaigua, plans to build an elameling plant, here. Estimated cost $1,000,000. Architect not announced.

N. Y., Long Island City—Perry Candy Co., 408 West Bway., New York City, will soon award the contract for the construction of a factory on Wilbur Ave., here. Estimated cost $75,000.

N. Y., Rochester—Eastman Kodak Co. plans to build a factory for the manufacture of chemicals, in East Kodak Park. Estimated cost $29,400.

O., Cleveland—A. Claus Mfg. Co., c/o A. H. Claus, Pres., 5701 Walworth Ave., manufacturer of store fixtures and cabinets, awarded the contract for the construction of a 1 story, 80 x 450 ft. factory and a 1 story, 80 x 240 ft. warehouse, on Brook Park Rd. Estimated cost $250,000.

O., Cleveland—W. E. Grimm, 3383 De Sota Ave., (manufacturer of candy), has had plans prepared for the construction of a 1 story, 40 x 100 ft. factory, at 3703 East 93rd St., here. Estimated cost $40,000. Private plans.

Pa., Columbia — The Peerless Folding Box & Crate Co., is having plans prepared for the construction of a 1 story, 50 x 200 ft. modern box and crate factory. Estimated cost $40,000. F. S. Sheeman, Swan Annex, Johnstown, Archt. Noted Aug. 17.

Pa., Glenshaw — Ball Chemical Co. awarded the contract for the construction of a 2 story, 64 x 113 ft. warehouse and manufacturing plant. Estimated cost $25,000. Noted Sept. 7.

Pa., Pittsburgh—Gulf Refining Co. is having plans prepared for the construction of a 144 x 175 ft. oil refinery plant on Mathilda and Gross Sts. Private plans.

Pa., Williamsport—W. D. Crooks & Sons, Park St., are having plans prepared for the construction of a 2 story, 125 x 160 ft. addition to its factory for the manufacture of doors. Estimated cost $75,000.

Va., Richmond—Ophuls & Hill, Inc., Engrs., 112-114 West 42nd St., New York City, will receive bids until Sept. 25 for remodeling plant here, install engines, compressors and a 120 ton ice making plant, etc., for the Merchants Cold Storage & Ice Mfg. Co., 208 South 6th St., Richmond. Estimated cost $250,000. N. Old, Jr., Mgr.

Wash., Brewster—The Standard Oil Co., Realty Bldg., Spokane, will receive bids until Oct. 1, for the construction of a 1 story, 40 x 60 ft. distributing station, including tanks, motor engines, etc., here. Estimated cost $20,000. G. E. McKay, Realty Bldg., Spokane, Engr.

Wash., Elk — The Standard Oil Co., Realty Bldg., Spokane, will receive bids until Oct. 1, for the construction of a 1 story, 40 x 60 ft. distributing station including, tanks, motor equipment, etc., here. Estimated cost $20,000. G. E. McKay, Realty Bldg., Spokane, Engr.

Wash., Elliot—The Standard Oil Co., Realty Bldg., Spokane, will receive bids until Oct. 1, for the construction of a 1 story, 40 x 60 ft. distributing station, here. Estimated cost $20,000.

Wash., Republic—The Standard Oil Co., Realty Bldg., Spokane, will receive bids until Oct. 1, for the construction of a 1 story, 40 x 60 ft. distributing station. Estimated cost $20,000.

Wash., Wilsoncreek—The Standard Oil Co., Realty Bldg., Spokane, will receive bids until Oct. 1, for the construction of a 1 story, 40 x 60 ft. distributing station including tanks, motor equipment, etc., here. Estimated cost $20,000. G. E. McKay, Realty Bldg., Spokane, Engr.

Wis., Antigo—The Faust Lumber Co. plans to build a 1 and 2 story, 75 x 190 ft. sawmill to replace the one which was destroyed by fire. Estimated cost $75,000. Architect not yet selected.

Wis., Antigo—Pacific Ice Cream Co. is receiving bids for the construction of a 2 story, 50 x 64 ft. ice cream factory. Estimated cost $50,000. H. Quackenbush, Mgr. Private plans.

Wis., Athens—Rietbrock Land & Lumber Co., 700 Cedar St., Milwaukee, will build a 2 story, 40 x 80 ft. planing mill, here, also a small blacksmith shop, etc. Private plans.

Wis., Green Bay—Fairmont Creamery Co., 200 North Bway., is having plans prepared for the construction of a 1 story, 40 x 60 ft. addition to its creamery, Foeller, Schober & Stephenson, Nicollet Bldg., Archts.

Wis., Milwaukee—Air Reduction Sales Co., 342 Madison Ave., New York, is having plans prepared for the construction of a 1 and 2 story, 30 x 80 ft. addition to its factory here on Buffum St. Estimated cost $30,000. Francisco & Jacobus, 511 5th Ave., New York, Archts.

Wis., Pardeeville—The Pardeeville Canning Co., plans to build a 2 story, 60 x 90 ft. factory. Estimated cost $40,000. Architect not selected.

Wis., Sheboygan—The Excelsior Wrapper Co., 1635 Erie Ave., awarded the contract for the construction of a 1 story, 142 x 148 ft. factory. Estimated cost $25,000. Private plans.

Wis., Winneconne — Winneconne Co-operative Exchange, c/o J. Dreske, plans to build a 2 story, 28 x 30 ft. grist mill. Estimated cost $10,000. Private plans.

B. C., Elko—Wigwam Pulp & Paper Co. awarded the contract for the construction of a 25,000 hp. power house, concrete dam, and also a sulphite paper making plant, 100 ton per day capacity. Estimated cost, first unit $3,500,000, total $10,000,00[illegible]